1772
XLII

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FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

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The Outlook

Africa as a Springboard

IN last week's issue of *Flight* the question of invading the Continent was discussed, and mention was made of the views of "Northerners and Southerners." In his broadcast on November 29th, the Prime Minister naturally said nothing which would give the Axis chiefs a clue as to whether he favoured one side or the other—or both. He did, however, speak definitely of Africa as a base for a new offensive against the enemy. "Africa is no halting place," he said. "It is not a seat but a springboard. We shall use Africa only to come to closer grips."

Mr. Churchill only explained his meaning by adding that from there we shall open the air battle upon a new front. The German air force was a wasting asset, whose new construction was not keeping pace with its losses, and the front line was weakening in numbers, and, on the whole, in quality. Therefore, it was our duty to engage the enemy in the air continuously on the largest scale and at the highest intensity. He added warnings to Italy of the fate which is impending.

These general principles, when translated into details of allocating Groups and squadrons of aircraft to particular duties, can only mean that what is sometimes called short-term policy is to take precedence of the long-term policy of attacking German production. Attacks by Bomber Command on German production centres will, of course, go on, probably with special emphasis on the nests from which U-boats go forth into the Atlantic. But quite obviously there is to be no marking time by all other fighting organisations in order to concentrate the whole Allied strength in bombers on the effort to deprive the Axis armies of equipment.

A short while ago there was, as Capt. Balfour remarked, no better way of hitting Germany than by bombing the cities where her factories are located. Now there is a better way (though the old way will not be neglected), and Mr. Churchill has made it clear that he intends to take it.

This new air campaign which Mr. Churchill has proclaimed will mean the sending of large numbers of squadrons, heavy bombers and others, to the Mediterranean theatre of war. One immediate objective must quite clearly be the Italian fleet, and every snug harbour in which its ships may have taken refuge must be pounded from the air until the vessels, if they survive the bombing, are driven forth in despair to face the British Navy.

Commercial Conversion

MUCH has been written lately concerning the question of post-war commercial aviation, and the feeling is growing that, although we cannot begin to build commercial types now, we ought at least to start *planning*. It can scarcely be argued that we cannot spare the men for that work, and *Flight* is all in favour of pressing forward with it. But there will inevitably be a period during which we shall have to make do with conversions until the new aircraft types designed specifically for commercial flying come into service.

It has frequently been pointed out that four-engined bombers, for example, do not make very good transport aircraft. That, of course, is obvious. They were designed for heavy loads concentrated in the bomb bay, and there is little enough room inside the fuselages for the free movement of the crew, let alone for passengers and/or freight. The unsuitability of the bomber is, however, confined mainly (although not entirely) to the fuselage. Logically, it would appear, therefore, that all that is necessary is to design a new and larger fuselage to fit existing bomber wings.

That even such a conversion would entail a fair amount of work may be granted, but it should certainly

be worth while. The conversion would be, in a way, the reversal of a scheme adopted by a German aircraft firm before the war 1914-18. Some of our older readers may remember that shortly before the outbreak of that war an Albatros biplane was brought to this country and demonstrated here by Robert Thelen. The Editor remembers the occasion particularly well, because he flew with Thelen from Hendon to the Royal Aircraft Factory, as it then was, at Farnborough. The unusual feature of that Albatros biplane was that it had three sets of wings, all of which picked up on the same points on the fuselage. The smallest set of wings had but a single bay, the intermediate set two bays, and the large wings three bays, the idea being that the same machine would do as a scout, for reconnaissance and for carrying enough fuel for a very long flight.

Admittedly, the complications of the modern bomber are far greater than those of the ancient Albatros, but the task of producing an alternative fuselage should not be beyond our present capacity, hard-pressed though we are for men and materials.

There is sufficient space left in most four-engined bombers between the tips of the inner airscrews and the fuselage sides to make it possible to insert a considerably wider commercial fuselage. It might even be possible to place the fuselage on top of the wing.

Committee Needed

REVERTING to the subject of planning post-war commercial aviation, it would appear that the first useful step should be the setting up of a committee to study the subject in all its aspects. We do not forget that the Shelmerdine Committee is still sitting, nominally at any rate, but it has not, so far as we are aware, submitted its report. In any case, an inter-departmental committee appears totally inadequate to deal with so vast a subject.

Commercial aviation will form an important part of post-war reconstruction. For example, there will be need for getting supplies to war-starved Europe within days of peace being concluded, and the surface transport of the Continent may well be in such a state by then that the air will be the only effective way.

The basis of such a committee, if and when it is formed, must obviously be wide, and a Parliamentary Committee, including Members of both Houses, would seem to be the best foundation. Many other sections of the community would, of course, be represented on the committee.

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"Mines were laid in enemy waters . . . ." A sea mine on its dolly waiting to be loaded into the bomb racks of the Hampden in the background. It will then be "parked" in the dead of night in some water channel used by the enemy.

RUSSIAN DIVE BOMBERS: A flight of three Stormoviks on their way to the attack.

War in the Air

German Transport Losses : R.A.F.'s Servicing Commandos : Daylight Raid on Eindhoven

IN the great advances made by the Russians on many sections of the front there has been little mention of the part played by aircraft in either bombing or fighting capacities. It has been mentioned, however, that the Germans have been using transport on a fairly extensive scale to try to take relief to those of their columns which have been threatened with encirclement. On one day, for example, the Russians reported that they had shot down twenty Ju 52s in the air and destroyed another 30 of the same type on enemy airfields. So evidently the Russian fighters have been keeping their eyes skinned and their powder dry.

Though the Germans are believed to have been well supplied with transport aircraft, at least up to a recent date, they must be finding it a difficult question where to use most of them, and the loss of 50 in one day to the Russians cannot be accounted a negligible loss. The same class of aircraft has been in great demand for the passage between Tunisia and Sicily. The R.A.F. and American Army Air Force have made a continuous series of heavy raids by day and night on the airfields of Bizerta and Tunis, as well as the harbour of the former, and the devastation of Bizerta airfield was so complete that the belief began to spread that most of the surviving German machines had returned to Sicily.

Bombers of the American Army have also raided the air bases at the smaller towns of Sfax, Gabes, etc., round the Gulf of Gabes, which lies on the eastern shore of Tunisia. At the same time the bombers of the Eighth Army have kept up a regular pounding of the port of Tripoli.

The position of Rommel's men is not very happy just now, and one cannot guess what he intends to do.

COMBINED OPERATIONS: General Eisenhower paid a special tribute to the part played by the Royal Navy in the North African expedition. This is one of the first pictures released showing an Albacore bombing up with armour-piercing bombs.

WAR IN THE AIR

Even prolonging his defence cannot cause the Allies very grave inconvenience. The Germans may use any time he can give them by building up their forces in Tunisia and Sicily, but that can only be done by partially denuding the Russian front. A German pilot has recently been taken prisoner in Tunisia who had not long before been flying over Stalingrad.

November Nights

WEATHER conditions of late have not made the task of Bomber Command any too easy, and it has now been disclosed that fog was a serious handicap throughout the area of our home bases on all but one night during the first half of last month; in fact visibility was practically nil on all but two nights. Nevertheless, Bomber Command laid no fewer than 500 mines in enemy waters in less than a week, and their total for the whole month was a record.

During this same period the R.A.F. destroyed 18 enemy aircraft over Europe, and ten more were shot down over this country. Additionally 15 German fighters fell to the guns of United States airmen.

More recently, when the R.A.F. were able to resume their offensive against the enemy's war industries, Frankfurt was one of the chief targets, and on the same night (Dec. 2nd-3rd) several other objectives in Western Germany were also attacked successfully, though not without loss. This was the first night raid on Germany since November 22nd, when a strong force of bombers hammered Stuttgart. Bad weather conditions made it difficult accurately to assess the effects of the attack on Frankfurt, which is an important river port and railway centre with many vital factories, and day was almost breaking when the last of our bombers returned to their bases. The German report on this attack made the usual attempt to minimise its weight by referring to it as a "nuisance" raid, and saying that bombs were dropped "at random." One will agree, of course, that it must be no end of a nuisance to the Germans

RIGHT, RIGHT,—STEADY! An American Liberator, its bomb doors open, is here seen starting its run over the target with *flak* bursting nearby. Axis shipping at Benghazi lies below.

to have factories producing their much-needed railway rolling stock, machinery, chemicals and electrical equipment subjected to a shower of incendiaries and high explosive by such "random" expeditions on the part of the R.A.F.

North Africa

IN Libya, the *Luftwaffe* made an effort to stage a come-back when packs of Messerschmitt fighters, numbering seven or eight at a time, shot up the advancing Allied columns on the Benghazi-Jedabia road. Bomber and fighter attacks were also made on other forward positions, but they are reported to have done very little damage. A phase of this spurt of Axis aerial activity took the form of tip-and-run raids, chiefly by single Junkers Ju 88 machines, over Northern Cyrenaica, including Derna and Martuba, but our fighters and ground fire took their toll of a number of these marauding lone wolves.

In the meantime, our night fighters made full use of a brilliant moon and beat up Rommel's lines with considerable effect, while behind the Eighth Army, the R.A.F. provides a protecting umbrella over the long lines of communication along which the transport columns press forward with the necessary supplies. At the same time British Liberators, and heavy bombers of the Ninth United States Air Force hammered the harbour installations at Tripoli and attacked tankers and other Axis sea-borne transports attempting to supply Rommel's urgent requirements. The Spanish Mole, the Karamanli Mole, and a large warehouse on the former were all hit, the last named being completely destroyed. Six merchant vessels and a tanker, southbound for the Tripolitanean coast, were also heavily damaged and, in some cases, set on fire.

In West Africa we have recently heard for the first time of the R.A.F.'s Servicing Commandos — fighting mechanics who repair and salvage aircraft in exposed positions which they may have to hold against attempted enemy interference, and so may be said to work "with a spanner in one hand and a gun in the other." Further west, an Allied column is reported to have cut the line of communication between Rommel's and Nehring's troops covering Bizerta and Tunis, which are being subjected to continuous bombing, while regular fighter sorties counter low-flying attacks on our own ground troops. Bizerta airfield and docks, and Gabes and Sfax have

AIR BLOCKADE: An unusually interesting picture of an attack by Beaufighters of Coastal Command on a convoy of enemy ships off the Dutch coast. Simultaneous assaults with cannon and m.g. fire is being made on several ships.

WAR IN THE AIR

also been attacked in daylight by our bombers.

In a counter attack, the Axis used paratroops dressed as Arabs to attack our transport, but these were quite easily disposed of.

On the other side of the Mediterranean, the R.A.F. have continued their hammer blows at the Italian war machine, and Turin has suffered particularly heavy damage. About the only sensible thing Mussolini said in his recent broadcast was that Mr. Churchill's "promise" of further attention from the R.A.F. must be taken seriously, and evacuation of Italian industrial towns is under way.

Farther east, American and British air forces continue to strike hard at the Japs in Burma, while in the Pacific Gen. MacArthur's Flying Fortresses have defeated further Japanese attempts to land substantial reinforcements at Buna, though it is thought that a small number may have managed to get ashore at a sixth attempt. The Mitsubishi fighters lost heavily in their efforts to interfere and protect their ships.

Philips Radio Factory

AS we go to press, details of the big daylight raids on Eindhoven, Holland, where an important radio factory producing for the Axis was wrecked, and on the Fives-Lille locomotive works, have been announced.

The former attack was made by a force of nearly 100 light bombers of the R.A.F. which were unescorted until on their way back, and the latter by U.S. Army Air Force B-17Es (Flying Fortress IIs). Another American force, flying B-24s (Liberators), also bombed the enemy airfield at Abbeville, and both these raids by the Americans were supported and covered by squadrons of R.A.F., U.S.A.A.F., Dominions and Allied fighters.

Although the official communiqué uses the phrase "light bombers" and does not specify the actual types used, it seems a pretty safe guess that these probably included De Havilland Mosquitoes, which are the latest and fastest of our light bombers; speed is obviously an essential for any such daylight raid carried through without constant fighter escort; but, even so, 12 of our light bombers failed to return. The U.S. Army communiqué, however, reported only one bomber and one fighter missing from their escorted raids on Lille and Abbeville, during which seven enemy aircraft were destroyed.

ENEMY AIR LOSSES TO DEC. 5th

	Over G.B.	Over Continent	Middle East
Nov. 29	0	0	1
,, 30	0	0	3
Dec. 1	0	3	3
,, 2	0	0	2
,, 3	0	0	2
,, 4	0	1	0
,, 5	0	0	1
	0	4	12

Totals: West, 6,494; Middle East and French Africa, over 5,054.

BRITISH & U.S. AIR LOSSES TO DEC. 5th

	Over G.B. A'crft.	Over Continent B'bmrs.	Over Continent F'trs.	Middle East A'crft.
Nov. 29	0	2	4	0
,, 30	0	0	0	2
Dec. 1	0	3	1	3
,, 2	0	6	1	0
,, 3	0	0	0	1
,, 4	0	0	4	0
,, 5	0	0	1	0
	0	11	11	6

Totals: West, 4,903; Middle East and French Africa, about 1,960.

AFTER THE SHOW: Carrier-borne Seafires played a big part in the North African landing, guarding against possible interruption from enemy aircraft. Here the Operations Commander is seen receiving reports from Fleet Air Arm pilots aboard their carrier after reconnaissance flights.

SOILED BUT SAFE: After 11 hours in the sea, this Hurricane pilot got ashore and hid for 24 hours from the retreating enemy in Libya and then walked into an airfield just after the Allies had retaken it.

These bombing raids, though the most important activities on that day, were not the only daylight attacks on enemy-occupied country. Mustangs of Army Co-operation Command and other aircraft of Fighter Command were also very much in action, the former shooting up railway targets, barges and German troops in other parts of Holland, while the latter "interfered" with German-controlled railway transport in Brittany. Altogether, some 400 fighters took part in the day's activities, and an analysis of the various reports indicates that all but six of them returned safely.

The chief target at Eindhoven was the German-controlled Philips radio works, about 60 miles inland from the Dutch coast. This was known to be well defended by heavy and light A.A. guns; and, since it employs some 15,000 people, the whole of whose production goes to the German armed forces, its significance is obvious.

The Merlin 61 Engine

DETAILS are to be released this week of the new Rolls-Royce Merlin 61 engine, the feature of which is the two-stage two-speed supercharger. By the aid of the new design double blower with its intercooler, the ceiling of the improved Spitfire has been increased to 40,000ft. An illustrated description of this new and highly important British development will appear in next week's issue of *Flight*.

HERE AND THERE

To Dispel Doubt

A CERTIFICATE to the effect that the appointment of Col. J. J. Llewellin, formerly Minister of Aircraft Production, to be Resident Minister in Washington for Supply, is required in the public interests for purposes connected with the war, has been issued by the Prime Minister.

This certificate removes any doubt that might otherwise arise about the retention by Col. Llewellin of his seat in the House of Commons.

It's an Ill Wind—

THAT civil aviation will benefit from the wartime developments in aircraft engines was a point made in the House of Commons the other day by Mr. Ben Smith, Parliamentary Secretary to the Ministry of Aircraft Production.

Saying that current design for essentially military purposes automatically embraced conditions appropriate for civil use, he voiced the opinion that they would be able to provide post-war civil aviation with engines which would compare favourably with any in the world.

High-speed take-off and high cruising power with a minimum of fuel consumption, consonant with the maximum reliability and minimum cost of maintenance, were qualities he quoted as equally applicable to military and civil types of aircraft.

Better and Better

PRESIDENT ROOSEVELT has said that considerably more "workmanship" would go into American aircraft production next year than this year.

Aircraft design, he added, had changed greatly in character since the beginning of the present year, and he suggested that people should ask if it was better, for instance, to have 10,000 aircraft, or 8,000 twice as good.

MIXED ARMAMENT: The nose of the Lockheed Lightning, now in service with the U.S. Army Air Force in this country, showing its two .5in. machine guns above the 20 mm. cannon, flanked by a pair of .3in. machine guns.

Future of the Helicopter

CLAIMING that the direct-lift aircraft lends itself to mass-production and could be turned out in hundreds of thousands for the price of a medium-powered motor car, Igor Sikorsky, designer of the Vought-Sikorsky VS-300 helicopter, contributes an intriguing article to the *Atlantic Monthly*, in which he visualises this type of machine in general use in 1955.

He admits, however, that because of the principles involved, the average medium-priced helicopter will probably not exceed about 140 m.p.h. and that twenty passengers will be about the capacity limit of airliner types.

Comparing the helicopter with the motor car, he says that it is simpler to control and that the cost of servicing will be as cheap, or cheaper.

In that case our post-war houses should have flat roofs!

Let Off Lightly

TWO Air Ministry officials were each fined £5, with costs, recently, for leaving plans and aerial photographs on the seat of an R.A.F. car parked in the market place of a north country town.

Even without knowing what excuse (if any) they had to offer, it seems to us they were let off very lightly indeed; one needs only one guess at what would probably have happened to them had they been German officials, guilty of similar carelessness, under the Nazi régime!

Lancasters from Canada

CANADA hopes to be producing substantial numbers of Lancaster bombers by next spring, according to a recent statement by Mr. C. D. Howe, their Minister of Munitions, who added that the Allied Forces in the Battles of Egypt and Libya used almost wholly Canadian mechanised equipment.

Red Cross Pennies

FORTY-ONE thousand employers in England and Wales are now affording facilities for their workers, numbering approximately 6,000,000, to make collective contributions to the Red Cross Penny-a-Week Fund. Thanks to their ready co-operation, the Red Cross and St. John is receiving an income of nearly £30,000 a week from this source. In addition, house-to-house collections bring in an additional £20,000 a week.

In view of the urgent need for additional revenue expressed recently by Lord Iliffe, Chairman of the Duke of Gloucester's Red Cross and St. John Appeal, it is earnestly requested that all employers whose workers are not already contributing should bring the scheme to the notice of their workers and provide the necessary facilities for collection. It is estimated that there are still some 50,000 firms and organisations where no penny-a-week contributions are made.

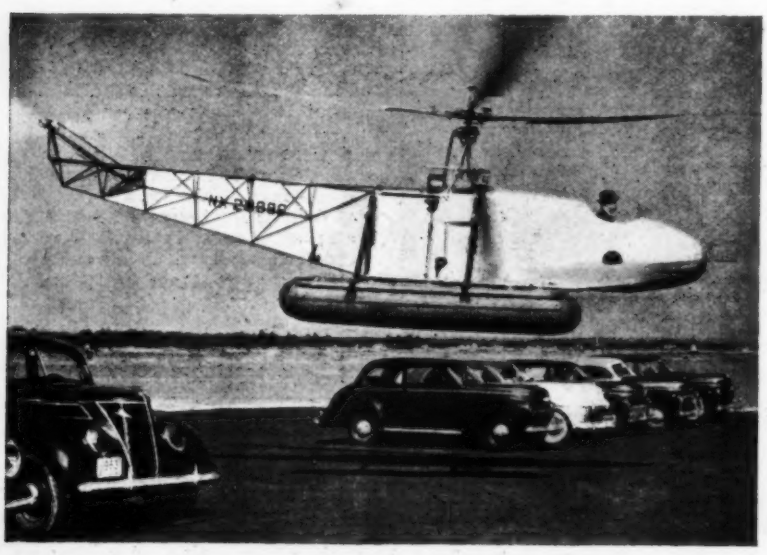
Full details of the scheme will be gladly sent to those interested on application to the Red Cross Penny-a-Week Fund, Bramshill, Eversley, nr. Basingstoke, Hants.

Old Soldiers Never Die

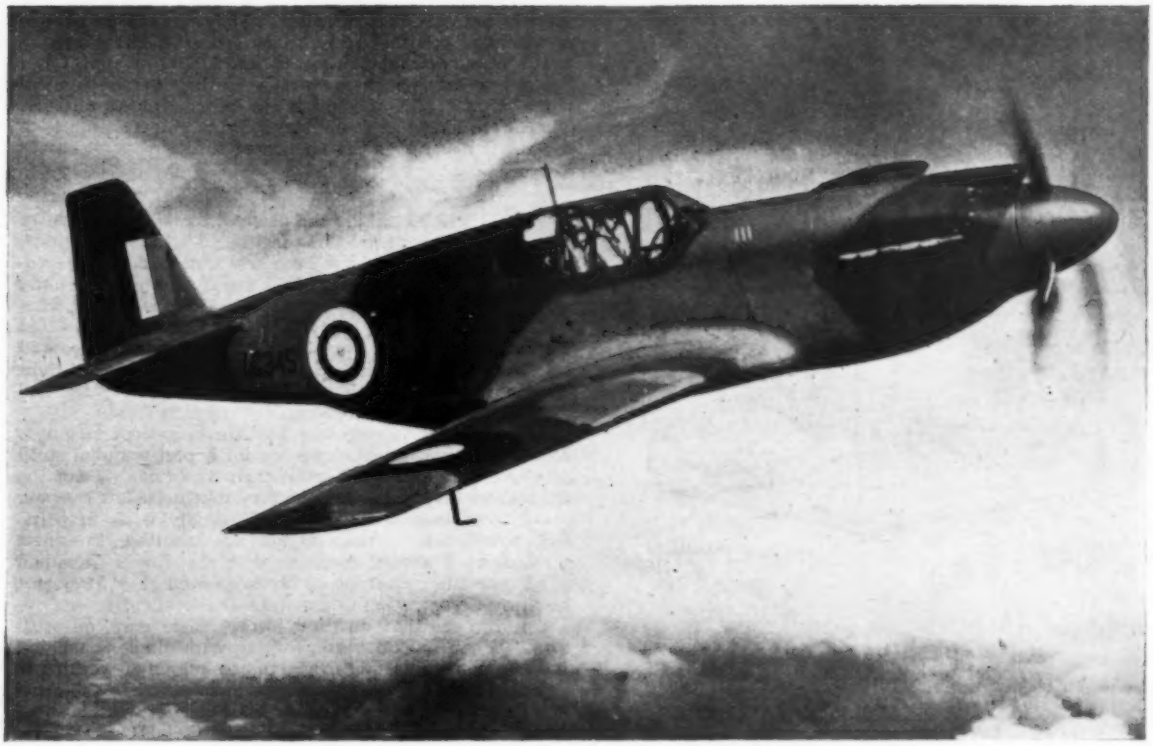
AS an example of patriotic enthusiasm, a recent letter received by the Air Ministry would be hard to beat.

It came from a man aged 90½ years, who said, regretfully, that although his health was now good, he had to be careful and could not leave his home, but could they refer him to some branch of the R.A.F. where copper-plate writing would be of use; he could, for instance, copy legal documents.

This stalwart served as a sergeant in the R.A.S.C. during the last war—at the age of 63 years!



PARK HERE: Igor Sikorsky demonstrates his latest amphibian helicopter and appears to be about to park it gently among the motor cars. The cylindrical floats are of rubber and fabric construction.



ARMY CO-OP MUSTANG

Visit to a Unit of Army Co-operation Command : Preparing for the Second Front : Blooding the Pilots

By Major F. A. de V. ROBERTSON, V.D.

IT is anxious work sitting in the Control Room, or Watch Room as it is sometimes called, of an operational R.A.F. station waiting for a formation to return from across the Channel. It is, of course, a common experience for those officers and airmen of the Air Force whose duty is the organisation of sorties against the enemy, but rather unusual for a civilian.

I was in one such room at a station somewhere in the South-East of England the other day when a small number of Mustangs were on their way back from a sweep over Northern France, and for some little time there was no news of one of the pilots. Something had gone wrong with his wireless, I think, and for a few minutes I thought the face of the Group Captain showed signs of strain. It can be no new sensation for him, this anxiety, but probably that makes it no easier to bear.

But at length the missing bird was safely home, the mild inquisition by the Army Liaison Officers was got through, and then I was allowed to talk to the pilots.

There had not been many Mustangs out that day, and the weather had not behaved itself too well, but one pilot had had all the luck that was going and had definitely damaged two railway engines, besides a possible. He said he had met the possible first coming towards him, and the surroundings were such that he could not swerve off and come in on a beam attack. It is the regular custom of Mustangs on these sweeps into France to fly very low, at about tree-top height, and sometimes below that. All he had time to do was to fire all his guns, and he did see his tracers hitting the engine. Then his speed carried him past, and he could not observe the effect upon the engine. Not long afterwards he came across two more trains in quick succession, one pulling four wagons and the other about a dozen. He was able to make beam attacks on both of these, and each time

Two Mustangs out on reconnaissance. The tactics employed are explained in the text.

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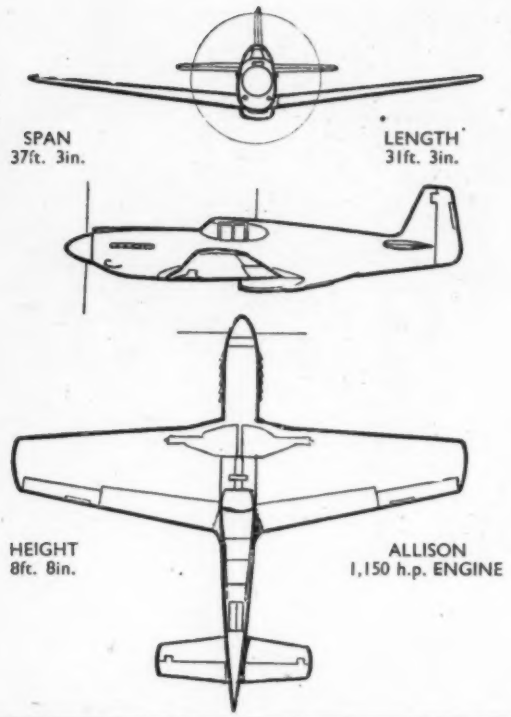


ARMY CO-OP MUSTANG

he saw steam fizzling out of the boilers, and the trains stopped—so much less transport for Hitler's supplies from Northern France!

This lucky pilot was a South African from Johannesburg, and it is appropriate that he should be in this squadron, for once upon a time it was composed entirely, or almost entirely, of South Africans. I well remember visiting it some years ago on a station a long way from its present home, when its equipment was Audax biplanes—very different from the Mustangs which it now flies.

Ground Strafing

The Audax was a two-seater, and great importance was then attached to having an air gunner in the back seat. It was supposed to free the pilot from all anxiety about attacks from the rear, and to allow him to concentrate his whole attention on his reconnaissance. That theory persisted for many years, in fact up to the days of the Lysander. But it was found in practice, chiefly in the Middle East battles, I understand, that the single gun, which had to be swung and aimed by hand, was not much protection against the attacks of modern fighters; most of the Middle East Lysanders, I believe, were shot down by enemy fighters.

The Mustang relies on its speed, and when it flies low its camouflage makes it very difficult to spot from above. When pursuing these tactics it is rarely troubled by fighters or by heavy *flak*. Light *flak* often has a shot at the Mustangs, and some pilots admitted to me that they did not really enjoy being fired at from the ground, but they added that usually they were past and out of sight before the gunners could swing on to them. On the little sweep which I saw start off and return some *flak* had been encountered but none of the machines had been hit.

This ground-strafing is not really the life's work of a squadron of Army Co-operation Command, but it is good for the pilots. These Mustang squadrons are tactical reconnaissance squadrons, prepared to do in single-seaters what their predecessors in the same squadrons used to practise in two-seaters. They have done periods of training with the Army on manœuvres, but naturally that got somewhat boring to the pilots—it has often bored the Army men as well—and they hankered after real "Ops." like the pilots in other fighter aircraft. They were like a pack of hounds which always hunted a drag and never had the chance of a kill.

Reco. Tactics

The authorities, taking the place of the M.F.H., decided that it would be a good thing to "blood" their foxhounds, and so the Mustangs have been sent out to shoot up locomotives and other targets, thus amusing themselves and also doing good work for the cause. There is not the least doubt that the pilots enjoy it! One had only to look at the beaming faces of my South African acquaintance and his fellows to appreciate that. Railway engines are their chief objectives, but signal boxes, marshalling yards and lorries all make good hunting.

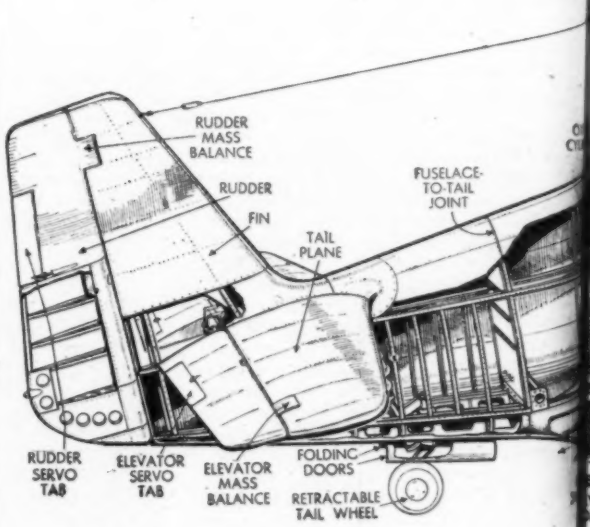
I was told with gusto how two Mustangs, not long ago, found two German officers going for a post-prandial stroll on the beach, and quite spoilt their digestions. I got the impression that there was not very much else left to spoil.

On these sweeps the Mustangs usually work in pairs, but sometimes special targets are allotted to single machines. I should mention that the Royal Canadian Air Force has squadrons of Mustangs and they form part of Army Co-operation Command.

One can see that on these sweeps there may, on occasions, be no objection to working with single machines, but the pilots must not forget the technique of working in pairs. Then, one does the reconnaissance while the other is chiefly occupied in guarding his tail, and weaves about him, keeping an eye open for "bandits." It must never be forgotten that these squadrons are the tactical recon-

MUSTANG ANAT

Cooling System an Interes



naissance units of the Army. That is why the pilots give their reports to the Army liaison officers. They will have to do that when the second front in Europe becomes a *fait accompli*, and so the practice is maintained during the period of what one almost feels inclined to call amusing themselves by ground-strafing in France, the Low Countries, and even Western Germany.

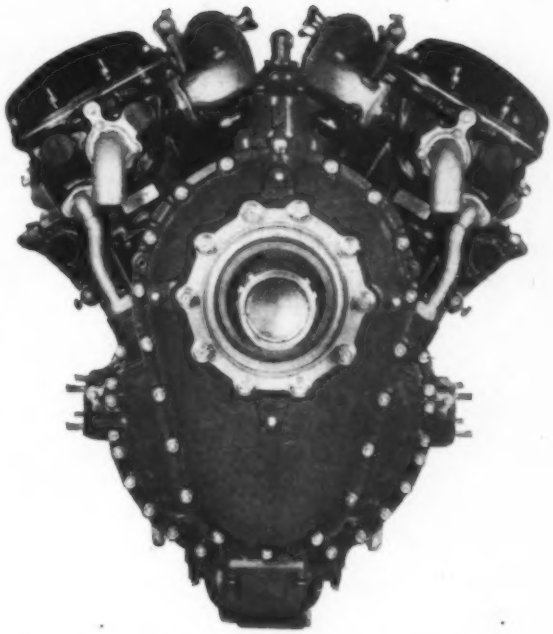
This exercise, of course, is not only amusing the pilots and blooding them; it also gives them experience in map reading, navigation and other desirable accomplishments.

But, for these squadrons, the real thing will come when the British Army is at grips with the Hun on land, and then the Army staff will want every scrap of information about the enemy's forward positions and movements that can be gathered by the "eye in the air." Spotting for the guns is also a function of the tactical reconnaissance squadrons, and that is a work of the very highest importance.

Artillery Observation

In a recent broadcast an Artillery officer from the Middle East talked about how the Royal Regiment had once more come into its own in the Battle of Alamein, and gave high praise to the F.O.O.s (forward observing officers) but strangely did not mention spotting by aircraft. However, everyone knows from the experiences of the last war (and common sense says that it cannot be different now) that, when the weather permits airmen to see the ground, the spotting aircraft is the best friend of the gunner. Also, it is a principle of the battlefield that bombers are sent against targets which the guns cannot reach, but that everything within range of the guns should be left to the artillery.

Once a battery has got the range it can continue firing until the target is destroyed, whereas bombers have to aim



The 1,150 h.p. twelve-cylinder Allison V.1710F3R engine which powers the North American Mustang. Bore 5½in., stroke 6in., dry weight 1,340 lb., single speed, single-stage supercharger, spur-type reduction gear, liquid-cooled.

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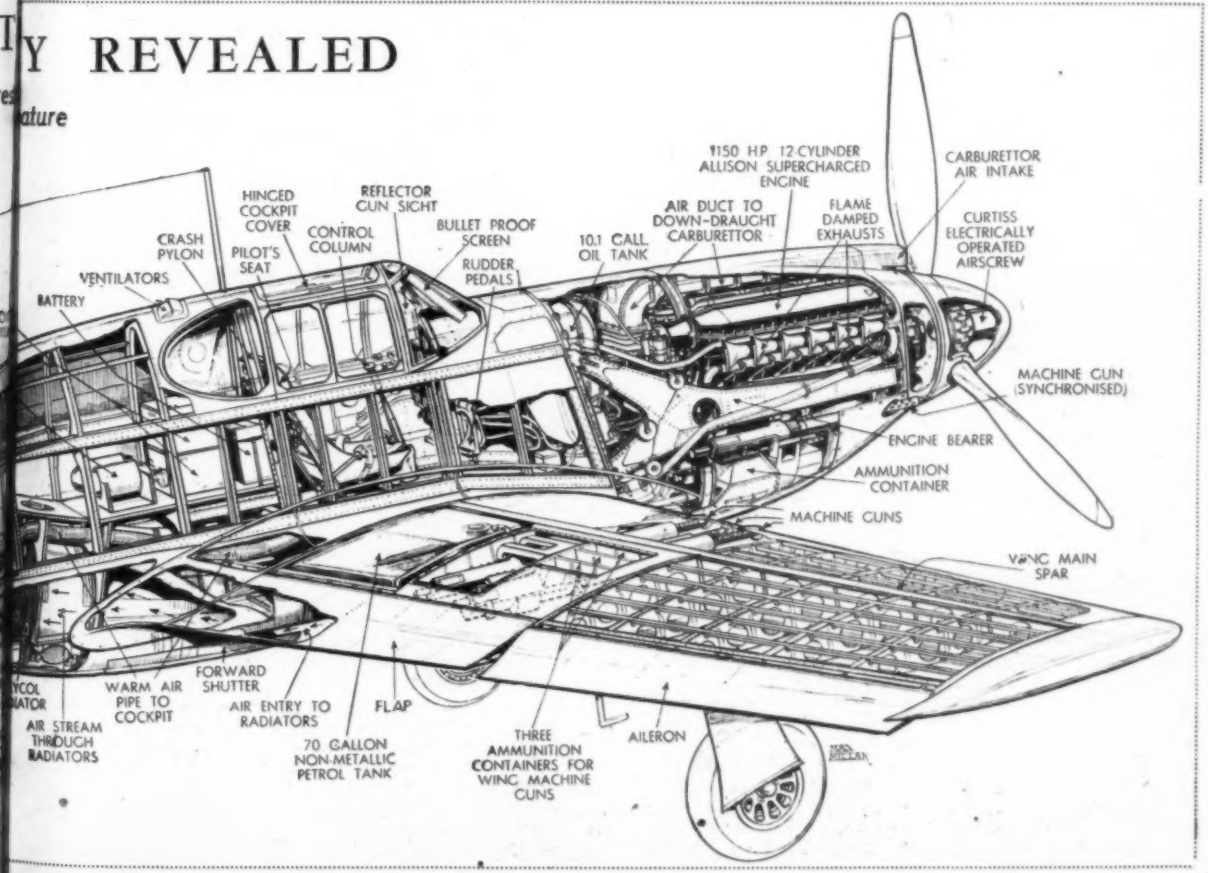
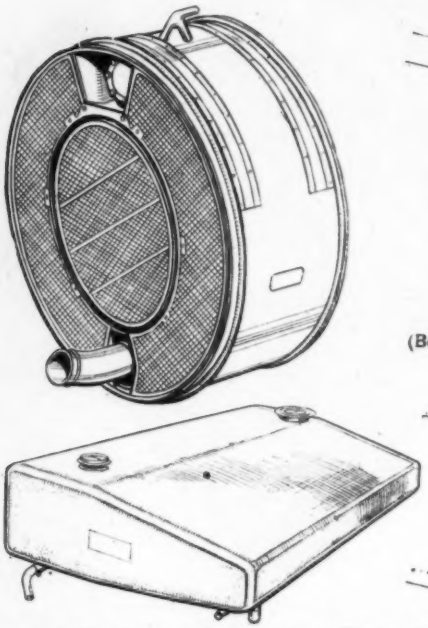
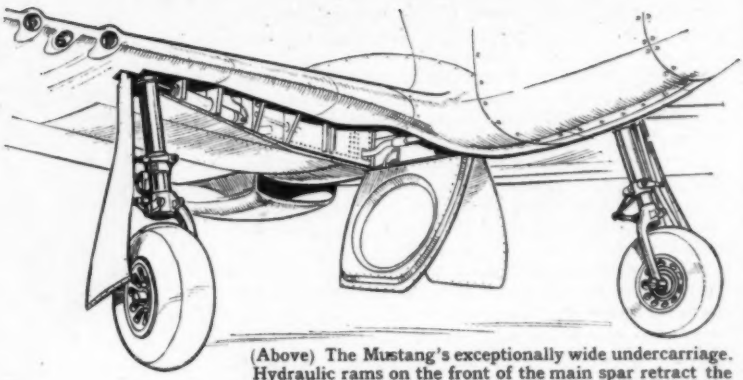


ARMY CO-OP MUSTANG

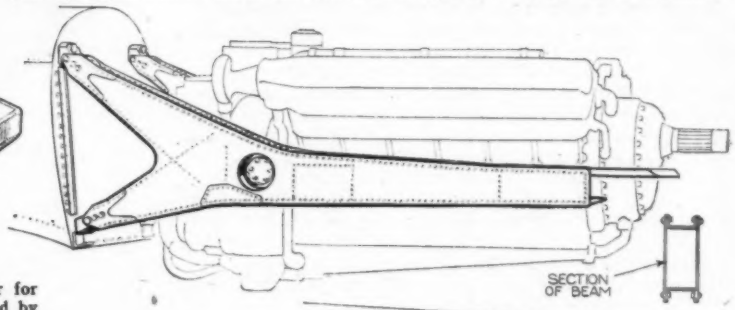


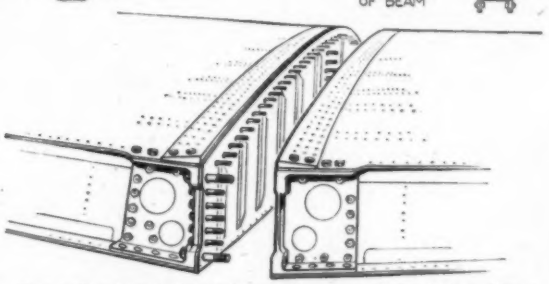
(Top) The double radiator unit; the outer for glycol and the inner for oil. It is supported by two metal straps to the underside of the fuselage. (Above) No metal is used in the tank construction. The entire skin is of fibrous material and self-sealing rubber. It is reinforced by the upper and lower wing-coverings.



(Above) The Mustang's exceptionally wide undercarriage. Hydraulic rams on the front of the main spar retract the legs inward before the wheel covering flaps hinge upwards.

(Below) Engine bearers are of box section made up from flat plates riveted together.





Two half-wings bolt together at the centre line. When offered up to the fuselage the top surface of the centre section becomes the cockpit floor.

afresh for each run, and accuracy may therefore be variable. The airman who quickly directs a battery on to a target is doing the enemy perhaps the maximum damage that one man can do.

Mustangs are rather on the fast side for artillery observation, and it will be necessary for the pilots to circle. But one cannot have it both ways. The Lysanders were too slow and were not heavily armed. The Mustangs, with their formidable array of machine guns, were primarily fighters, and when working in pairs could put up a stout resistance when attacked. In addition, the practice which the pilots are now getting in low flying will give a further chance of escape if they are attacked by enemy fighters. It may be assumed with some confidence that few German fighter pilots have the same experience in low flying, and in dodging round trees and roofs.

Fighter Cover

But it is no business of tactical reconnaissance aircraft to give overhead protection to the Army. Their job is to see, and not to fight if fighting can be avoided. Command of the air is for Fighter Command to establish, and when protecting the Army the Spitfires (or whatever the latest fighter type may be when the Army invades the Continent) will include protection of the Army's own aircraft.

The Middle East has arrived at the ideal way of combining the two Services into one fighting force, and, of course, there are the Middle East pilots who have been trained in Army Co-operation Command. Reports from the Middle East on all descriptions of tactics are (it goes without saying) being carefully studied in Britain, and soon Air Chief Marshal Sir Arthur Tedder will be coming home to his new appointment as Vice-Chief of the Air Staff.

He will certainly find a keen and competent lot of squadrons who are waiting with avidity for the day when they can help the Army to settle with what the Russians will have left of Hitler's main war machine.

Most of the structural features of the Mustang are shown in the drawing by Mr. Millar on the previous pages, as well as the arrangement of armament and equipment. An appreciation of the aerodynamic design features of the machine was published in our issue of August 20th, 1942. Here it will suffice if it is recalled that the N.A.73 (the North American works) bears evidence of very careful design, both structural and aerodynamic. Credit for this must be given to many technicians who co-operated in the work, but above all to Mr. E. Schmued, the chief designer, whose interpretation of the British specification has resulted in a type of aircraft well above the average.

A fact which does not emerge from illustrations, nor from an inspection of the machine, is that it is very well liked by the pilots, who find that it combines excellent performance and good manœuvrability.

Perhaps the most distinctive feature of the Mustang is the placing of the radiator under the fuselage, aft of the wing. This arrangement leaves a very clean airflow over the nose and probably has a very low drag.

The Mustang is a product of North American Aviation, Inc., of Inglewood, California, the firm responsible for the Harvard trainer and the Mitchell bomber, both of which are in service with the R.A.F.

AIRCRAFT NOISE

Airscrew and Exhaust the Worst Offenders : Ventilation a Problem

By D. C. GREENWOOD, A.M.Inst.B.E.

Sources of Noise in Aircraft

THE first part of this article, published in last week's issue, dealt with the nature of sound, its velocity and intensity, and methods of measuring and recording noise levels. This week the author examines the several sources of noise in aircraft, and shows how some noises may be reduced at the source. Soundproofing must do the rest to make flying comfortable for the occupants of aircraft, and methods of doing this are outlined.—ED.

Airscrew Noise: The main sources of noise in an aircraft are:—

(a) Airscrew noise.
(b) Exhaust noise.
(c) Engine clatter.
(d) Aerodynamic noise.
(e) Ventilating noise.

The airscrew noise consists of two components, the rotation note, which possesses a frequency equal to the number of rotations per second times the number of blades in the airscrew; and the other is the vortex noise. The rotation noise is the fundamental note which gives the low pitched roar. The most important determinant of an airscrew noise is, however, its tip speed. It is generally agreed that a linear relationship exists between noise level in decibels and tip speed. For a 3-blade metal airscrew the equation for noise level in decibels is approximately:—

Noise level (decibels) = $19 + 0.11\,V$ where V is the tip speed in feet per second.

The maximum intensity level of an airscrew occurs in the plane of its blades, and is due to the fundamental note. This note is hardest to insulate against so that a cabin should not be situated in this plane. The clearance between the airscrew tip and the fuselage is another factor which must be considered. The intensity level varies as $\frac{1}{r^{2.5}}$ where r is this clearance within certain limits.

When the tip is too close to the fuselage considerable noise increase can be brought about by the causation of panel vibration. In one particular case where there was only a two-inch clearance a panel vibrated with an amplitude of about ¼in., causing most of the noise in the cabin. This panel was removed and a floating one fixed. A noise reduction of 10 decibels followed. This reduction could only have been obtained with a clearance of 12in. if this had been possible.

Davis (Ref. 2) gives the following rules for noise reduction.

Noise reduction of:—

10 decibels per 100 ft./sec. reduction in tip speed.
1 decibel per degree in pitch setting.
10 decibels for change to conventional thin section.
5 decibels per foot diameter increase of airscrew (for given power, forward speed, and similar operating point on the efficiency curve).
10 decibels for change to 4-blader of same diameter (for given power and appropriate speed).

If the tip speed is excessive the airscrew noise accounts for most of the noise in an aircraft. The most effective way, then, of reducing the noise level is to reduce the airscrew tip speed and use large-blade propellers, preferably with more than three blades.

Exhaust and Engine Noise: The exhaust noise is usually greater than the airscrew noise, due to the general practice of gearing engines. Only in the case of small, ungeared engines does the airscrew noise exceed exhaust noise. If the difference in intensity is more than 10 decibels either way, then the lowest note could be entirely eliminated yet the noise level would remain unchanged, and in any noise problem the loudest offender must be dealt with first.

In general, the exhausts should be kept as far as possible from the cabin for, roughly, sound intensity decreases as the inverse square of the distance. Various types of exhaust mufflers may be used, but they should not cause any appreciable back pressure, or be too heavy.

Engine noise may be said to comprise valve and tappet clatter, gear, carburettor, and supercharger noise. It is usually below the level of the exhaust noise; the difference being about 14-15 decibels (Ref. 3). What the engine can do, though, is to transmit vibration to the cabin structure. Thus great care must be taken in the matter of elastic suspension, for drumming and rattling fittings can cause annoyance out of all proportion to their noise level.

Aerodynamic Noise: The clean, streamlined aircraft of to-day makes any great consideration of aerodynamic noise relatively unimportant. One point, however, which is worth consideration is the ventilation noise. Care should be taken to ensure that any gaps or other openings which might cause the air to "scream" are effectively dealt with. It is pointed out that whereas an aircraft might show no such gaps on the ground, in the air, when different stresses are experienced, gaps which do not appear on the ground might appear. Ducting also should be composed of a sound-absorbing material, for a lot of noise can be led into the cabin through the heating ducting.

Table II

Comparison of Noise Levels of Inefficient and Efficient Design.

Source	Noise Level in Decibels	
	Inefficient Design	Efficient Design
(1) Airscrew	122	100–104
(2) Exhaust	118	100–104
(3) Engine clatter	104	89– 99
(4) Aerodynamic noise ..	94	79– 84
(5) Ventilating noise ..	114	72– 76
Total noise	126	100–106

Table II, from Zand (Ref. 4), shows the difference between inefficient design and efficient design in the achievement of noise reduction. It excludes the use of soundproofing.

Soundproofing Aircraft

Having done everything possible in the actual design of the aircraft in order that its noise level might be reduced, the next consideration is that of soundproofing the interior of the cabin. This resolves itself into two problems. The first is the question of the transmissibility of sound; second, the absorption of sound once it has gained access to the cabin.

The two are mutually dependent upon themselves, for it can be shown that if, say, the absorption coefficient of a material is zero, then even if it had a high insulation to noise there would eventually be a noise level inside the soundproofed enclosure just as high as that prevailing outside. This is because the sound energy which did gain admission, or was transmitted through the walls, would, if not absorbed, gradually build up until equilibrium was

REFERENCES
(2) Noise. A. H. Davis. Royal Aeronautical Society, 676 (1931).
(3) Reports of Tests on Reduction of Airplane Noise by Use of Mufflers. U.S. Dept. of Commerce, Air Commerce Bul., No. 12 (Dec., 1932).
(4) Comfort in Air Travel. S. J. Zand. Royal Aeronautical Society, 524 (1936).

AIRCRAFT NOISE

reached with the noise level existing outside. Thus good absorption is always desirable. In order to obtain large sound reductions it is necessary to have a low transmissivity and a high absorption coefficient.

Table III
Attenuation and Absorption Coefficients of Various Materials

Material	lb./sq. ft.	Thickness	Average transmission loss in decibels	Absorption coefficient
Hair felt	0.58	0.58"	6.1	—
Ditto, 2 layers ..	1.16	1.16"	10.5	—
Sailcloth	0.09	0.03"	8.5	—
Fibre board ..	0.75	0.5"	23.0	—
Aluminium ..	0.35	0.025"	17.9	—
Plywood	1.4	0.06"	30.0	—
Cotton fabric 14 oz./sq. yd. draped to half its area ..	—	—	—	0.49
Hair felt	0.08	0.137"	—	0.3
Balsam wool ..	0.29	1.0"	—	0.55
Balsam wool ..	0.52	2.0"	—	0.58
Glass wool	0.34	1.0"	—	0.92
Insulite	0.41	0.5"	—	0.53
Rock wool, felted..	—	1.0"	—	0.61

The practice in soundproofing aircraft is to use pads or blankets of lightweight fibrous materials, and by using several layers of sheets it is possible to get considerable absorption and consequent reduction in noise level. Table III gives the attenuation and absorption coefficients of various materials.

It can be shown that:—

$$\text{Noise reduction (decibels)} = 10 \log_{10} \frac{\alpha S + \tau S}{\tau S}$$

where α = absorption coefficient.
τ = the transmissivity, or the fraction of energy which is transmitted into the cabin.
and S = total surface area.

Fig. 4, obtained from the above equation, shows the noise reduction in decibels plotted for different values of α and τ. An important consideration is evident from Fig. 4. It is illustrated as follows. Suppose $\alpha = 0.1$ and $\tau = 0.01$, then the noise reduction is 10.4 decibels. If, now, a further reduction of 10 decibels is desired, then either the interior treatment of the cabin may be changed so as to give an increase of absorption coefficient to 1.0; or, keeping $\alpha = 0.1$, change the structure of the cabin wall so that τ decreases to 0.001. The decision as to which course to take must be decided by consideration of the relative weights of the two treatments. The lightest, of course, being superior, other things being equal.

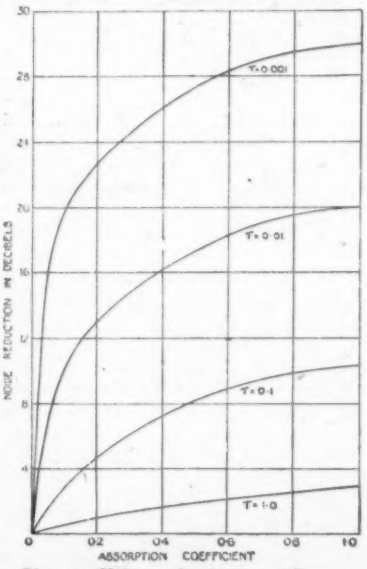


Fig. 4. Noise reduction *v.* different values of α and τ.

Table IV
A Typical Example of Achieved Noise Reduction

Areas and Coefficient of Absorption of Cabin

Component surface	Area sq. ft.	α at predominant frequency	Absorption = $\alpha \times$ area
Ceiling	220	0.80	176.0
Front bulkhead ..	42	0.85	35.7
Side walls	230	0.78	179.5
Rear walls	63	0.85	53.5
Rug	30	0.28	8.4
12 passengers at 3 sabines	—	—	36.0
12 chairs at 2.8 sabines*	—	—	33.6
Parcels, curtains ..	—	—	15.0

Total absorption = A = 535.7 sabines.

* The product, $\alpha \times$ area gives the number of units of absorption or the number of sabines.

Areas and Transmissivities of the Cabin

Component surface	Area sq. ft.	τ	Transmittance = $\tau \times$ area
Cabin, inc. floor ..	800	0.000675	0.5400
12 windows and 2.25 sq. ft.	27.5	0.0087	0.2405
Doors — very good fitting	24.0	0.0002	0.0480

Total transmittance = T = 0.8285

$$\text{Noise reduction in decibels} = 10 \log_{10} \frac{A}{T} = 10 \log_{10} \frac{535.7}{0.828} =$$

26.3 decibels.

Table V
Noise and "Comfort" Levels of Various Types of Vehicles

Vehicle	Noise level	Comfort level	Conversation level
Two-engine bomber	115	Painful	Impossible
Two-engine air liner	75	Comfortable	Normal
Railway car ..	80	Uncomfortable	Possible
Underground railway	100	Painful	V. difficult
Touring car ..	55	V. comfortable	Normal
Sports car.. ..	90	Slightly uncomfortable.	Shouting
Ocean motorboat, cabin class ..	49	V. comfortable	Whispering

In making a choice of materials for sound absorption there are, of course, other properties to be considered, apart from the absorption coefficient. As has been said, weight is the most important consideration. The material should have the minimum of weight consistent with good absorption. Then, although a material may have a high absorption and low density, it still may not be the best to use, for it may lack other important properties. Due consideration must be given to such qualities as heat conductivity, moisture absorption, fire resistance, packing under service conditions, and chemical stability.

A typical example of the noise reduction achieved by soundproofing is given in Table IV. One very important point is that of areas of transmission. If, say, a window is open to the extent of 1 sq. ft., then it could be shown that a reduction of efficiency in the above case would take place to the extent of more than 3 decibels. Small spaces, which could easily total 1 sq. ft., should not be overlooked, or, also, any areas of particularly high transmissivity.

Table V gives some idea of the noise and "comfort" levels of various types of vehicles. Further advance in noise reduction methods would seem to depend upon theories of "multiple partitions" which have been put forward. These indicate that it may only be necessary to distribute the soundproofing material at intervals.

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AIRCRAFT TYPES AND H

BRISTOL BLENHEIM IV and IVF

THE prototype of the Blenheim I was inspired by the Bristol 142, a civil type named "Britain First," which proved so successful on test that it was presented to the nation by Lord Rothermere. The Blenheim IV became generally known as the "long-nosed" Blenheim in contrast to its "short-nosed" predecessor. Incidentally, the "142" had the low-wing arrangement, but this was changed to mid-wing on the first Blenheim to suit military requirements, and the first batch of production short-nosed Blenheims were delivered to newly formed squadrons of the R.A.F. in the spring of 1937.

The Blenheim IV appeared the following year and has been giving valiant service ever since. Then, in 1940, there appeared the Blenheim IVF, which incorporated a battery of four forward-firing fixed machine guns in a fairing below the fuselage (and, more recently, the Mark IVL long-range fighter), but it still retains the pair of Brownings in the semi-retractable power-operated dorsal turret. A subsequent addition to the armament of the Mark IV bomber was a single remotely controlled rearward-firing gun in an offset blister under the nose; long-nosed Blenheims will still be seen either with or without this blister, and sometimes with light external bomb racks aft of the bomb doors.

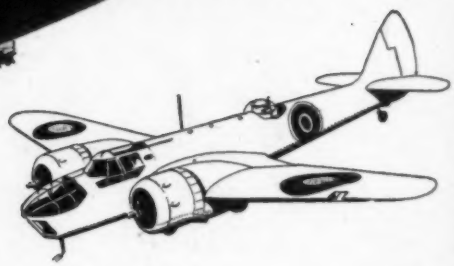
Two Bristol Mercury XV nine-cylinder air-cooled radial engines power the Blenheim, each providing 920 h.p. for take-off and with an altitude rating of 840 h.p. at 14,000ft.

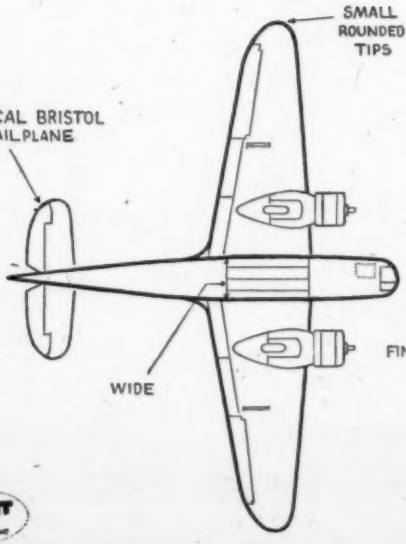
Except for the fabric-covered control surfaces, the structure is of light alloy throughout, the fuselage being of the monocoque type and the wings of two-spar construction; both have stressed-skin covering, and the wings were fitted with split trailing-edge flaps and Bristol-Frise mass-balanced ailerons. The undercarriage units retract backwards into the engine nacelles, leaving the lower portion of the wheels slightly protruding and visible.

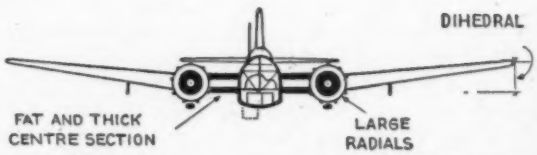
From the spotter's point of view, the long-nosed Blenheim is characterised by its straight level back with turret amidships, the distinctive shape of the nose, which has optical flats for the bomb-aimer, and its unmistakably "Bristol" design of tail unit.

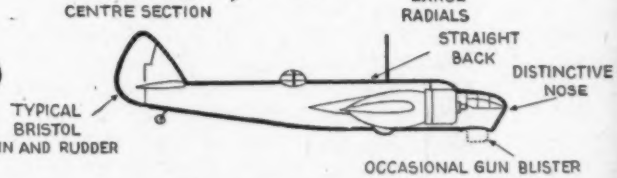
Its top speed is 295 m.p.h. at 15,000ft., service ceiling 27,000ft., and range 1,900 miles at a cruising speed of 220 m.p.h.

Top speed : 295 m.p.h.







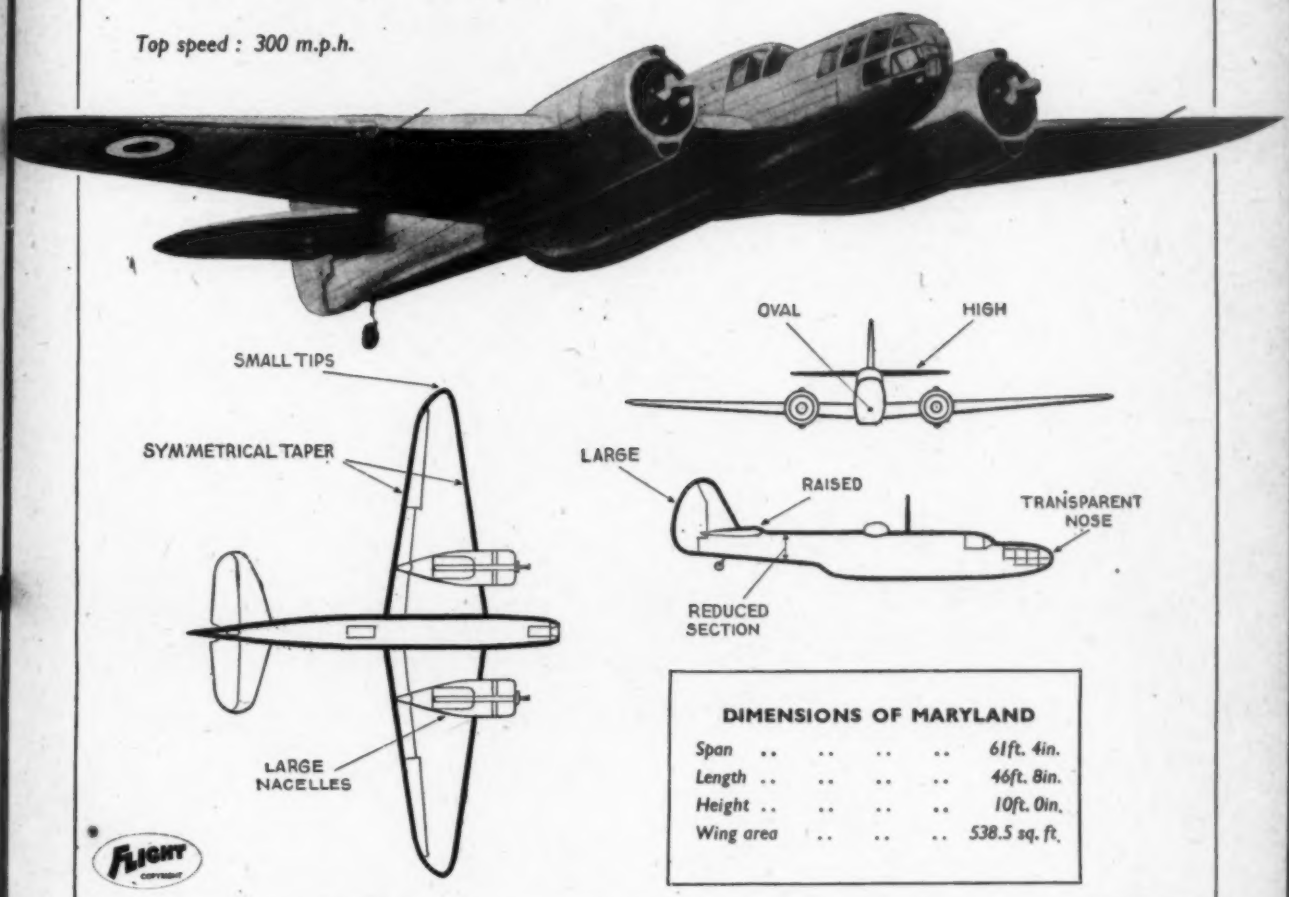


DIMENSIONS OF BLENHEIM IV

Span	*56ft. 4in.*
Length	*42ft. 9in.*
Height	*9ft. 10in.*
Wing area	*469 sq. ft.*

D HEIR CHARACTERISTICS

MARTIN MARYLAND



DIMENSIONS OF MARYLAND

Span	*61ft. 4in.*
Length	*46ft. 8in.*
Height	*10ft. 0in.*
Wing area	*538.5 sq. ft.*

THE Martin Maryland, which has given wonderful service with the R.A.F. in the Middle East, was originally built to a U.S. Army specification, and is known to them as the Martin 167. Some 200 of them were ordered by the French Government early in the war, and a few reached the squadrons before the capitulation, the remainder of the order being taken over by Great Britain.

Incidentally, this created a first-class "spotter's headache" during the operations in Syria, for a number of Martin 167s were being used by the Vichy French and, apart from their markings, were identical in external appearances with the R.A.F.'s Marylands, so that fighter pilots, air-gunners and A.A. crews could never be certain until the last moment (and not always then) if the approaching aircraft were friend or foe; an understandable tendency to shoot first and argue afterwards must, on occasions, have produced unfortunate results!

In the Western Desert the Maryland proved to be a most valuable aircraft, fulfilling the roles of medium bomber, attack-bomber and reconnaissance-bomber with great efficiency and unfailing reliability. Though not perfect, it was so good that it formed the basis, after due experience in the exacting conditions of desert action, for an improved R.A.F. specification which resulted in the production of its successor, the Martin 187, duly named the Baltimore, and which closely resembles it in many respects.

Although officially described as a low-wing type, the Maryland should be classified for recognition purposes as a low mid-wing, since the underside of the forward part of the fuselage projects a little below the centre-section of the wings. There is a lower gun position aft of the trailing-edge beyond which the section is reduced, while the top line of the fuselage is stepped up at the rear to the high-set tailplane. A dorsal turret and four fixed wing-guns complete its defensive armament. Maximum bomb load is 1,250 lb. in internal bomb bay. Alternatively, an auxiliary fuel tank can be housed in the bomb cell for long-range reconnaissance duties.

Constructionally, the Maryland employs a semi-monocoque fuselage and wings built up on two metal box spars; external covering is flush-riveted stressed skin except for the usual fabric covering to control surfaces. Wings and fuselage are both built in three sections, and slotted flaps are fitted.

Two Pratt and Whitney 1,050 h.p. Twin Wasp radial air-cooled engines supply the power, and give a top speed of just over 300 m.p.h. at 13,000ft., a service ceiling of 29,500ft., and a cruising range of 1,300 miles at 250 m.p.h. at 11,500ft. Alternatively, two Wright Cyclone nine-cylinder 1,100 h.p. engines may be fitted, when the performance is somewhat lower, top speed then being 288 m.p.h. at 18,500ft.

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BEHIND THE LINES

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Danish Ambulance

THE Danish Government has concluded negotiations for the purchase of another aircraft for its ambulance service. The aircraft, which is being built by the Danish *Skandinavisk Aeroindustri*, is a twin-engined type accommodating a crew of two, a doctor, a nurse and two patients.

Since it is intended for ambulance work between the various small Danish islands, it is designed to land on runways only 164ft. long and requires only 230ft. for take-off.

Reward

ON behalf of his Government, the Spanish Military Attaché in Berlin decorated Professor W. Messerschmitt with a high Spanish order. This is said to be in recognition of services rendered by Messerschmitt in the overthrowing of the Republican Government.

It will be remembered that *Luftwaffe* squadrons operating in Spain during that period and later, formed into the Condor Legion, were equipped with the early version of the Me 109. The opportunity to have these machines tested under real combat conditions was fully exploited by the Germans.

Nazi Dispersal

DESCRIBING his experiences during a trip to German coastal defences in France, a Norwegian newspaper correspondent states that on a visit to a *Luftwaffe* airfield in Brittany he was amazed at its "abnormal" size. When he asked for an explanation the correspondent was informed that the immense size was due to the fact that workshops and hangars had to be placed as far apart as possible, and that aircraft on the ground must be dispersed at least some 300ft. apart to reduce the risk of hits by R.A.F. sweeps.

Female Flak

SINCE the end of the 1942 summer term, German girl students have been in service with the "Flak" artillery. In the Cologne-Aachen district, forty-two girl students have joined the crews of A.A. batteries to replace men who were passed fit for service on the Russian front.

The scheme is now to be extended to other districts of Germany, and the military authorities are urging girl students to give up their studies and sign on for the duration.

Jap Manœuvres

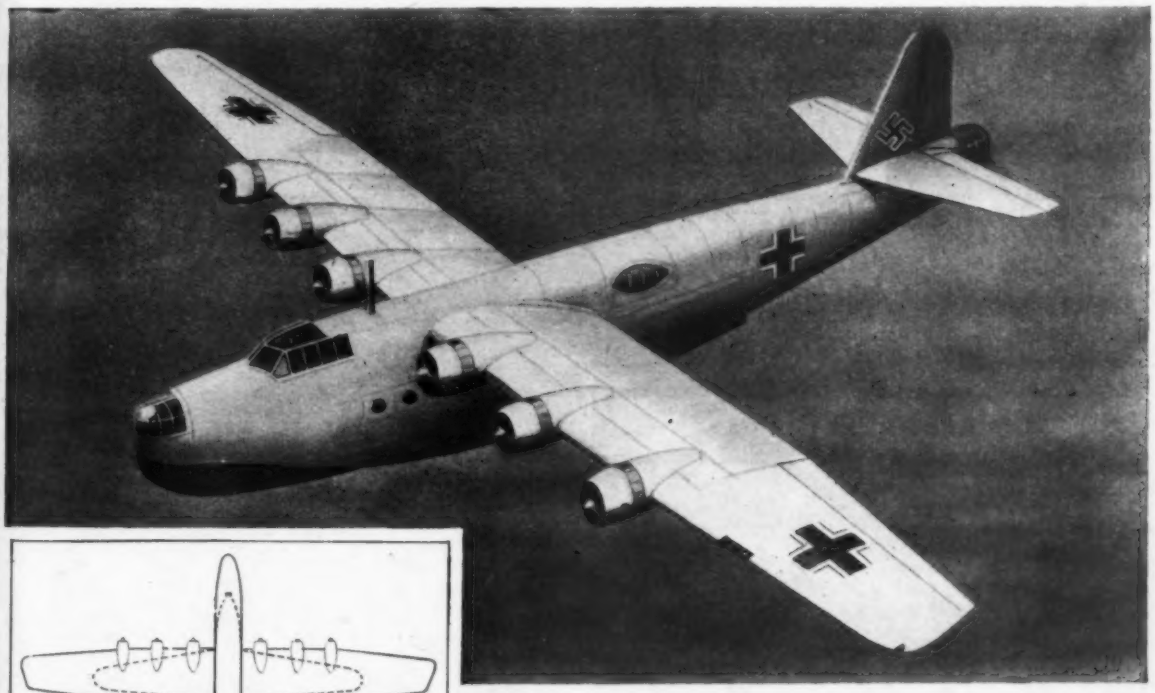
UNDER the command of Major General Nukada, of the Japanese military academy, combined manœuvres of officer cadets of the Army and the Army Air Force were held about a fortnight ago.

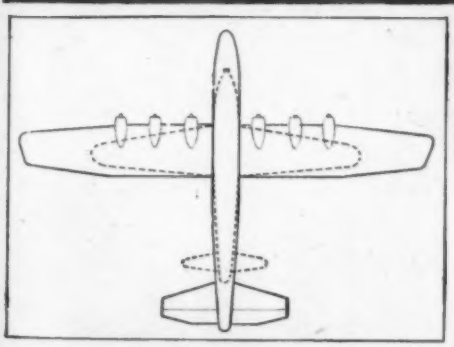
The exercises took place in an area about twelve miles west of Tokyo and some 10,000 students of both the Army and Air Force Academies are said to have taken part.

From Italy

IN the course of the concentration of industry now in progress in Italy, a number of industrial firms have been taken over by the well-known Pirelli, Montecatini and Edison Companies. The Pirelli Company absorbed the *Societa Tassili Artificiali* (S.T.A.R.) in Milan, the *Societa An. Cotonifici Riuniti* and the *Soc. Italiana Ebanite Gostituti*, both also from Milan.

The S.T.A.R. works produce high-duty artificial silk fibres which replace the cotton ones used before the war for the manufacture of automobile and aircraft tyres and are said to be equally good. The Ebanite Company produces diverse plastic equipment for aircraft.





A *Flight* copyright drawing by "J.P." of the Blohm and Voss BV 222 flying boat. One of these six-engined boats was shot down recently on its way between Tunisia and Italy. It is thought that only a very few of them exist and information filtering through to this country is conflicting. Span is about 150ft. and length between 110ft. and 120ft. The engines are six B.M.W. 132 D.C.s of 1,000 h.p. each. Maximum speed 200 m.p.h. A range of 4,400 miles is claimed at a cruising speed of 170 m.p.h. The small diagram on the left shows the BV 222 lines superimposed on those of a Short Sunderland.

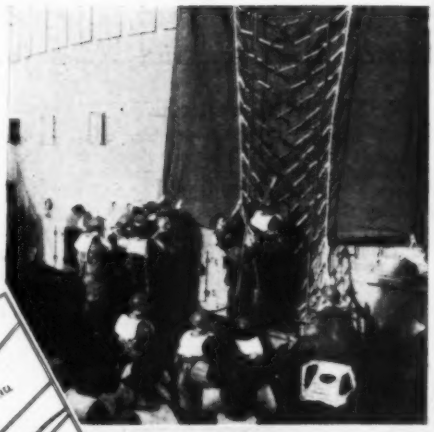
NORTH AFRICAN LANDINGS

Spitfire Squadrons Occupy Maison Blanche Airfield

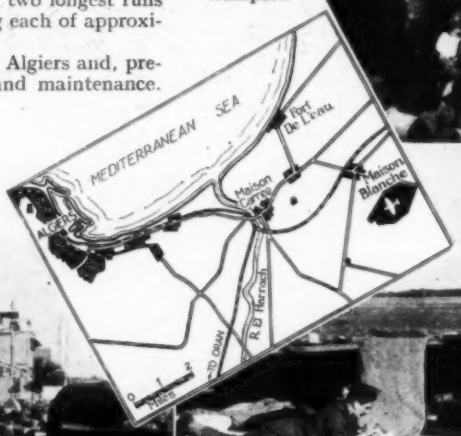
ON this page is a series of exclusive photographs taken during the occupation of this important Algerian airfield by the R.A.F.

Maison Blanche is some eight miles from the city of Algiers and is 70ft. above sea level. The two longest runs are north-south and east-west, these being each of approximately 1,000yd.

In peacetime it was the civil airport for Algiers and, presumably, there are facilities for repair and maintenance. It is equipped for night flying.



Lifeboat drill on the troop transport.

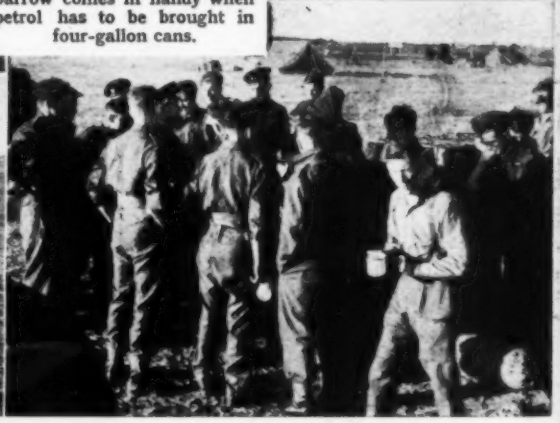


(Below) R.A.F. ground staff on the shore after landing.

(Above) The airman on the left makes an inventory of equipment while the pilot shows an airman how to open a tin without a tin opener.

(Below) In working order. The tropicalised Spitfires dispersed round the perimeter. In the foreground are airmen's kitbags.

(Above) Refuelling. A wheelbarrow comes in handy when petrol has to be brought in four-gallon cans.



(Above) Pilots ready for operations. (Right) Airmen have a welcome cup of tea after preparing the airfield.

AN AIRBORNE DIVISION

Parachute Troops : Air-landing Troops : The Glider Pilot Regiment : Army and Air Force in Unison : New Style Warfare

By MAJOR F. A. de V. ROBERTSON, V.D.

Glider pilots are essentially trained soldiers as well as airmen. In the photograph above the first and second pilot of a Hotspur glider are shown jumping from their aircraft to take their place with the troops.

SCENE (as Shakespeare would have put it): A Blasted Heath. In fact, it was a cold, unpleasant, sullen day in December, and I was in no mood for appreciating the beauties of the landscape. Only once that day did I feel adequately protected against the rigours of the weather, and that was during the half-hour or so which I spent flying over the scene of the coming battle in a Horsa glider. It was comfortable inside, but a Horsa does not exactly give one a grandstand view of the terrain, for the windows are few and small, and it was instructive to get some idea of what travel inside a glider is like. I tried to picture moving up to a real battle *per* Horsa, and could not help contrasting it with a memory of 1915, when the Division to which I belonged started off one afternoon on a 25 miles march up to take part in the second battle of Ypres. The air-landing troops in the Horsa would certainly arrive on the scene much less tired than we were.

The nearest thing to a thrill in this glider flight was gazing at the Army sergeant who was our pilot. He was a member of the Glider Pilot Regiment, a new formation in the British Army. It is not a regiment in the same sense as the Buffs or the Sherwood Foresters. Membership of this regiment, however, is a privilege much prized by all members. All have to be very good men. Piloting a glider is heavy and tiring work and the man in charge has to be tough as well as competent. They have all been trained by the Flying Training Command of the R.A.F. to fly, first light power aircraft and then gliders. There was an article on their training in the issue of *Flight* dated July 2nd, 1942. In addition to being very good pilots, these men have to be able to use all the weapons with which an air-borne Division is equipped, bayonets, tommy guns, mortars, hand grenades, Spen guns and many others, and they have also been trained in the use of various German weapons which they may capture and want to turn against the foe. They are, in fact, men of extremely high accomplishments.

With sub-machine guns at the ready, airborne troops leave their gliders and proceed to the attack.

Presently our Horsa released the tow rope, landed, and we passengers all (dare I invent the word?) deglidered. Then the sham fight began. Somewhat dimly we saw through the mist a Whitley approach, and from it numbers of parachutes fluttered down to the ground. Elsewhere other bodies of air-landing troops came to earth in gliders, and with the utmost speed all took up positions to attack a hill which was supposed to be held by the enemy. All became hurry and excitement, but very orderly hurry.

The Division in Action

The spectators, including several Canadian officers, scrambled into American "jeep" cars (Blitz Buggies, the Army calls them) and dashed wildly across the heath to the foot of the hill. Incidentally, the blitz buggies are amazingly comfortable even when moving at speed across country. Our air-borne troops had taken up a position behind some trees to our rear, and the bombs from their mortars went whirring over our heads. It recalled old times of 1915 once again. Other men with rifles and Bren guns crept forward, advancing and lying down, and so well did their uniform blend with the wet grass that the jeep drivers had to keep a sharp look-out for fear they should run over them as they lay stretched on the ground. The principles of tactics are the same as of yore, though the methods of applying them are different. For instance, to the old soldier it was a novelty to see tracer bullets from the Bren guns flying into the enemy position. The way the men moved forward was most skilful, and one could see that all were very highly trained, and that the subordinate leadership was of a high class. Every now and

AN AIRBORNE DIVISION

again a signal was given for a crescendo of fire from all weapons, and it was really amazing to realise that all these troops and all this concentration of weapons of different kinds had arrived on the scene by air. We saw nothing of the R.A.M.C., R.A.S.C., transport or signalling units, but we knew that they would be there, too, in the real thing. As the attack got near the crest of the ridge it encountered what was supposed to be a pill-box, and that was dealt with in smart fashion. At a suitable moment the mortars put down a smoke screen. The final stage, of course, was a charge with the wicked-looking little four-edged bayonets which are so much less cumbrous than the old-fashioned weapons. These new bayonets are common to all the Army, and they must add a good deal to the accuracy of rifle fire when bayonets are fixed.

Modus Operandi

This attack was a revelation of what air-borne troops could do. The next thing was to learn how they do it. So we were shown specimens of the various ways in which equipment is carried, either in gliders or in canisters to be dropped by parachute. There are various sorts of canisters, suitable for different kinds of equipment, and a great deal of inventive ingenuity has been expended in designing them and planning what they should carry. Naturally, the parachute troops cannot be so elaborately equipped as the air-landing troops from the gliders. The former are the more spectacular, the more romantic, so to speak, and more thought has been needed in deciding what is the minimum equipment which will make them an efficient forward striking force; but the air-landing men, when they can be used, are the more formidable body in numbers and in equipment. They may not always travel in gliders; troop-carrying power-aircraft will doubtless be available in time. Mr. Churchill in one of his striking speeches expressed grave doubts as to which he would prefer, 1,000 heavy bombers or 1,000 transporters. The Germans trust mainly to the Ju 52, and the Americans have developed a number of types of large transporters. In French Africa British parachutists have dropped from American machines which had been adapted to both methods of dropping.

One of the most gratifying things about a visit to an Air-borne Division is the whole-hearted cordial manner in which the Army and the Air Force work together. The G.O.C. of the division which I visited is Maj. Gen. F. A. M. Browning, an enthusiast if ever there was one. He sees practically no limits to the ways in which air-borne troops may be used in the future. His right-hand man—one might also say his *alter ego*—is the officer commanding the R.A.F. formation. It has been recorded in *Flight* that the Flying Training Command of the R.A.F. undertakes the training of the Glider Pilot Regiment, teaching the officers and men first to fly light power-aircraft and subsequently putting them through a conversion course on to gliders. It is not the simplest matter in the world to take charge of a glider on tow, keeping it either above or below the slipstream of the tug, as circumstances may render desirable; and, of course, the pilots must be unerring in bringing their gliders safely to earth after the tow has been cast off—no second chance is possible, and the lives of all in the glider depend on a correct landing. The Army Co-operation Command provides all the aircraft, the gliders, the tugs, and the troop-carriers, from some of which the parachute men drop. The Air Force also designs the canisters and other equipment. But its responsibilities do not end there.

When all these things have been prepared, they are handed over to the R.A.F. formation, which is allocated to an Air-borne Division, and then the R.A.F. Commander's work commences. It is obvious that by day air-borne troops must be very vulnerable to attack by enemy aircraft. The Germans and Italians have found that out in the Mediterranean. So, a daylight operation should only be undertaken to a destination where a fighter escort is possible, and if such an enterprise is decided upon, it is for the O.C., R.A.F., to arrange with the Air Force for that cover to be provided. But night work also appeals strongly to an air-borne division. It makes surprise possible, and surprise is even more desirable in these operations than in an ordinary Army attack. It follows that extremely careful routing of each aircraft is necessary; and likewise equally careful briefing of each pilot. It is intricate work and very exacting. One does not dare to think of the catastrophes which might follow if the G.O.C. and the O.C., R.A.F., did not work in absolute harmony. They have to be two parts of one whole, and in the Division which I visited there is no doubt at all that they are so. It really seems strange that two men so closely associated in one enterprise have to wear different uniforms and belong to separate Services; but it is the spirit which matters, and that is obviously all that could be desired.

It is a step in the right direction that an air formation should be permanently allocated to each air-borne division, but it almost goes without saying that more aircraft are wanted, for everybody everywhere wants more. No doubt there is a good time coming.

Training

From study of the equipment we passed on to see the training of the men. Again one must emphasise the distinction between the parachutists and the air-landing troops. We will take the parachute men first. In *Flight* of October 30th, 1941, there was a description of how they start by dropping through the hole of a dummy fuselage on to a mattress a few feet below, and also learn by practising on swings to control the oscillations of the parachute. This swinging is kept up in the division, and at one spot on my Blasted Heath there were tall scaffoldings where the men practised the drill of coming down by parachute. They always ended by letting go a few feet above ground (there was soft sand below, like the pit of a long jump) and turning a complete somersault. Then there was the parachute tower, some 80 feet high, from which the rate of descent was controlled. Here the men did not wear the complete harness, but gripped the shroud lines with both hands. This keeps them in good practice. When dropping through the hole in a Whitley the man must first, as it was described, stand at attention on air. As he gets nearer to the ground he bends his knees, keeping his legs close together, and manipulates the shroud lines so that he falls face downwards on the ground. The great thing is to avoid hitting the back of his head, which might knock him out. The Americans tell their men to drop with their feet apart, but Gen. Browning is convinced that our way is safer.

Next we were shown dropping from the basket of a kite balloon. The basket holds four men at a time, and drops are made with the balloon usually at a height of 500 feet. Here I was able to stand quite close to where the men landed, and they seemed to me to meet the ground with quite a wallop, but these men are extremely tough in every way, and they did not seem in the least upset by the shock, but promptly set to work to get clear of their harness and to deflate the parachute. They ran about with great alacrity. All air-borne troops have to move fast the very moment they set foot on the ground. The flight, the landing, or the drop are not the end but the beginning of the matter. The real business is fighting. They will be landed at a reasonable distance from enemy forces, and must be prepared to double for anything up to ten miles, carrying all their manifold weapons and equipment. They are constantly at the double.

Air-landing troops have to be selected with the same care as parachutists. Whatever the Germans may have done (and in our study of their operations we believe that they have made many mistakes), we do not just order so many infantrymen to get into a glider or troop-carrier and believe that we then have so many useful air-borne troops. Our men are all volunteers, and the medical authorities subject them to a very rigid examination before they are

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accepted. One thing which is considered with care is the man's reason for wanting to join. Some have just been bored with ordinary Army routine, some have got on bad terms with their sergeant-major and want to escape from his grip (these are rarely of much use, and are not often accepted), others are men of enterprising natures who want to do something really active, and these last make the best men for an air-borne division. All likely men are tested for intelligence, for eyesight, and for reactions to air travel or jumping, as the case may be. Colour blindness is more common than is generally supposed, and that is a fatal bar to acceptance as a parachutist, for these men have to recognse the colour of signal lights and also the colours of the various parachutes which bring down their equipment.

Air-landing troops must not be subject to air-sickness, and it has been found that their propensities can be tested with about 80 per cent. accuracy by swinging them on a swing on which they lie full length. That saves a lot of time and trouble; otherwise there would be delay in waiting for a bumpy day, and expense in fuel and man-hours in testing them in the air. Practice sometimes enables a man to overcome a tendency to air sickness.

Officers and men in an air-borne division all get an extra 2s. pay a day because of the extra risks which they undergo while training. But, while they are required to be able and ready to rough it in a high degree when on operations, care is taken to make their lives as comfortable and happy as possible in between times. All ranks are taken fully into the confidence of the G.O.C. before they start off on an operation. Initiative and self-reliance are of the highest importance in air-borne troops, and each man must know by heart exactly what he has to do the moment he lands. He must have in his mind a clear picture of the ground on which he will find himself, so that he will be able to find his way about even in the dark—and probably most of the landings will be made by night. This means that every man is trusted to keep his mouth shut, and if the operation is postponed through weather or for other reasons he has to keep his secret even from his best girl. Such a postponement has occurred already, and none the less when it came off it was a surprise to the enemy, which showed the splendid way in which each man realised his responsibilities.

Not the least important point which has to be impressed on every man is that the ammunition carried by air is limited and that, whatever the weapon he may be firing, every round must tell. Additional supplies may arrive, but no sure reliance can be placed on that. The men must count on performing their job with the ammunition which they take with them.

There is no branch of the Army in which more is asked of every officer and man. Air-borne troops have a good right to count themselves the *crême de la crême* of the British Army.

BOOK REVIEWS

Materials of Aircraft Construction. By F. T. Hill, F.R.Ae.S., M.I.Ae.E. (Fifth Edition.) Sir Isaac Pitman and Sons, Ltd. 20s.

THIS work, first published in 1933, has become so well known that it is almost a standard reference on the subject. The fifth edition now published, includes the few special concessions made necessary since the last edition in 1940, with the addition of synthetic and plastic materials in their appropriate places now in common use. The volume will be extremely useful to every aircraft engineer and technician.

Six-Figure Trigonometrical Tables, prepared and published by The Trade School of Ford Motor Company, Ltd., Dagenham, Essex. 1s. 6d.

SCIENTISTS, engineers, draughtsmen, navigators and students will welcome this handy pocket book, comprising 54 pages of tables and formulæ and the six trigonometrical ratios for every minute of angle, a direct-reading set of trig. The book fills a long-felt need, and the Ford Company are to be congratulated upon producing such a handy booklet.

"Magnetic Crack Detection." By G. B. Young. Charles Griffin and Co., Ltd., 42, Drury Lane, W.C.2. 2s. 6d.

ABSENCE of literature dealing with the practical side of magnetic crack detection should make this small book an essential addition to the library of any Inspection Department, where this type of equipment is being used. The book describes the improved methods of magnetisation and outlines the working principles with valuable practical information by the author, who obviously is an expert in the use of this equipment, and apparently no essential points have been omitted.

New War Maps.

THE firm of John Bartholomew and Son, Ltd., of Edinburgh, has just issued two new maps in connection with the war. One covers Russia in Europe and the other is a survey map of Iceland. At the moment the former is of the greater interest. Its scale is 1:4,500,000, which gives 250 miles to 3½ inches. It extends from the Arctic Ocean down to include Cyprus, all Turkey, and part of Persia, while on the west it includes all Norway, Berlin, Vienna, and Greece, stretching eastwards to include the Ural Mountains and the Caspian Sea. The map is contour-coloured, and is as clear to read as are all Bartholomew maps. The price of each of these maps is 3s.

"Essential Metallurgy for Engineers," by A. C. Vivian, B.A. (Cantab), D.Sc. (London). Sir Isaac Pitman and Son, Ltd. 8s. 6d.

WRITTEN by a Lecturer at the School of Aeronautical Engineering, R.A.F., with an introduction by Professor R. S. Hutton, M.A., Professor of Metallurgy, Cambridge University, this is a much-needed contribution to engineers and students alike. The work does not cover a wide field, but it does explain what really controls the properties of metals and alloys, and special attention has been given to heat-treatment processes, with chapters on aluminium and magnesium-base alloys. Well written and illustrated, it can be recommended as a most useful reference to all in the industry.

A Bibliography of Aviation Medicine. By Ebbe Curtis Hoff and John Farguhar Fulton. Charles C, Thomas, Springfield and Baltimore, U.S.A. $4. *(London Agents: Bailliere, Tindall and Cox, 8, Henrietta Street, W.C.2.)*

PREPARED by the authors, both of the Laboratory of Physiology of the Yale University School of Medicine, for the Division of Medical Sciences of the Office of Scientific Research and Development, Washington, D.C., U.S.A., this bibliography covers world literature, with 6,000 citations from 800 journals, and an author index of some 19,000 names. British, American, French, Italian and German sources of information are given in detail, and extensive references appear also to Russian and Japanese sources.

We Rendezvous at Ten. By "Blake." Victor Gollancz, Ltd. 8s. 6d.

AMONG the many books published since September 3rd, 1939, about fighter operations this is rather unique. It deals, not with one squadron, but with a whole station on which three Spitfire squadrons are accommodated, and it looks at the life of the station through the eyes of a Control Officer. For some years before the war any sort of description of a R.A.F. Operations Room in print was almost enough to send the rash writer into durance vile; but since the publication of the film "The Lion has Wings" Operations Rooms have become matters of general knowledge. All the same, probably few people realise the marvels of the working of such a nerve centre.

Roger MacMurray, the Control Officer who is the hero of this book, does not spend all his time on duty. He wanders round the station, taking the reader with him, and introduces the said reader to pretty well all the varied activities of R.A.F. station life. Pilots are one side of that life, but by no means the whole of it. There are, for example, W.A.A.F.s, Intelligence Officers, Accountant Officers, Mess Secretaries, Administration Officers, and many varieties of airmen. Roger introduces his readers to nearly all of them.

At the end there is a big fighter and bomber sweep over France, which gives the book its title. The scrapping is well described, but that sort of thing has been done before, and the reader, looking back after finishing a most enjoyable book, will probably decide that the most interesting and dramatic scenes are those inside the Operations Room.

WHAT'S IN A NAME?

Designation Systems Used by U.S. Air Forces

MANY readers have no doubt been confused by the variety of names, letters and numbers employed to designate American aircraft. We in this country adhere to the simple method of giving an aircraft one name and sticking to it, indicating subsequent versions of the same machine by the addition of a Roman numeral, plus an appropriate letter to indicate functional modifications.

Thus, for example, we begin with a Hawker Hurricane, although the makers' name is nowadays often omitted. Improvements in due course resulted in the Hurricane II, while differences in functional equipment of the Hurricane II are clearly indicated by Hurricane IIB (bomber version) and Hurricane IIC (cannon version).

When a landplane is adapted for navy use in the Fleet Air Arm we merely prefix the word "Sea" as in Sea Gladiator and Sea Hurricane. The Navy's Spitfire is a recent slight exception; it has been named the Seafire, but even this is simple and self-explanatory.

America, however, employs combinations of letters and figures, each of which has its special significance; it is more or less in the nature of a code. This is further complicated by the fact that the U.S. Navy uses a different code from that of the Army.

Let us first dissect the U.S. Army code. This employs a letter or combination of two letters to indicate the type of aircraft, and a number to indicate a specific model. Subsequent developments of the same model are indicated by another letter; thus we see, for example, that the machine designed to the Army's 17th specification for a bomber is the B-17, which happens to be the Boeing Flying Fortress. The one accepted on the Army specification No. 20 for an attack type is the A-20, known to us as the Douglas Boston. Later developments of these two examples are, of course, the B-17E and the A-20A.

The U.S. Navy method also uses letter symbols for the type, but adds a third letter to indicate the makers' name. Numbers, separated from the letters by a hyphen, show variations of the same model, while subsequent types in the same classification are indicated by inserting a figure in front of the makers' letter, thus the SBD-1 and SBD-2 are two different versions of the Scout bomber (SB) produced by Douglas (D); when, however, the same company supplied a second and completely different model of Scout bomber, this was known as the SB2D-1.

Sometimes, of course, the same machine will be in service with the Army and Navy, differing only in the equipment required by these two Services, and will be known to each by a totally different set of symbols. An example of this is the aircraft we know as the Douglas Dauntless, which the U.S. Army calls the A-24 and the U.S. Navy know as the SBD-1. Unfortunately, the two American air forces seem to have worked out their codes quite independently, with the result that the same combination of letters can mean one type in the Army and a quite different type in the Navy. The following table illustrates a few examples:—

Symbols	Type in U.S. Army	Type in U.S. Navy
P. ..	Pursuit	Patrol
P.B. ..	Two-seater Pursuit	Patrol Bomber
P.T. ..	Primary Trainer	Patrol Torpedo
F. ..	Photographic	Fighter
G. ..	Autogiro	Single-engined Transport

It is only fair to add, however, that B stands for bomber and O for observation in both Services.

A few American aircraft are also given names by their manufacturers, such as the Boeing Flying Fortress, Martin Mariner, Vought-Sikorsky Kingfisher and the Curtiss Helldiver, but these are in addition to the official symbols.

Here is the complete officially approved list of U.S. Army Air Force and U.S. Navy aircraft type symbols, together with the manufacturers' letter symbols employed by the latter service. Although only 24 firms are listed among the Navy's aircraft and there are 26 letters in the alphabet, it will be noticed that in several instances two or more makers share the same letter, which can only add to the complication; the letters G, I, L, Q, R. V and Z are not used at all.

Experimental types prefix "X" to the usual combination of letters and numerals, as, for example, XPB2M-1, which is the Martin patrol bomber, *Mars*.

Army

Attack	A	Photographic	F
Autogiro	G	Pursuit	P
Bombardment	B	Pursuit (Biplace) ..	PB
Cargo (Transport) ..	C	Rotary Wing	R
Combat, Basic	BC	Training, Primary ..	PT
Fighter (Multiplace) ..	FM	Training, Basic	BT
Observation	O	Training, Advance ..	AT
Observation (Amphibian)	OA		

Navy

Bombing	B	Utility	J
Fighting	F	Bombing-Fighting ..	BF
Miscellaneous	M	Observation-Scouting ..	OS
Observation	O	Patrol-Bombing ..	PB
Patrol	P	Patrol-Torpedo	PT
Scouting	S	Scouting-Bombing ..	SB
Torpedo	T	Scouting-Observation ..	SO
Training	N	Torpedo-Bombing ..	TB
Transport (multi-engine)	R	Utility-Transport ..	JR
Transport (single-engine)	G		

Manufacturers' Symbols: Navy

Brewster Aeronautical Corporation	—A	Fairchild Aircraft Corp.	—K
Boeing Aircraft Co. ..	—B	Kinner, A. & M. Corp. Ltd.	—K
Beech Aircraft Co. ..	—B	Glenn L. Martin Co. ..	—M
Curtiss-Wright Corp. ..	—C	Naval Aircraft Factory	—N
Douglas Aircraft Co. ..	—D	Lockheed Aircraft Corp.	—O
Bellanca Aircraft Co. ..	—E	Pitcairn Aircraft Inc. ..	—P
Grumman Aircraft Eng. Co.	—F	Sikorsky Aircraft ..	—S
Hall-Aluminum Aircraft Co.	—H	Stearman Aircraft Co. ..	—S
Stearman - Hammond Aircraft Corp. ..	—H	Northrop Aircraft Corp.	—T
North American Aviation	—J	Chance Vought Aircraft	—U
Keystone Aircraft Corp.	—K	Waco Aircraft Corp. ..	—W
		Experimental	—X
		Consolidated Aircraft Corp.	—Y

AMERICAN GENEROSITY

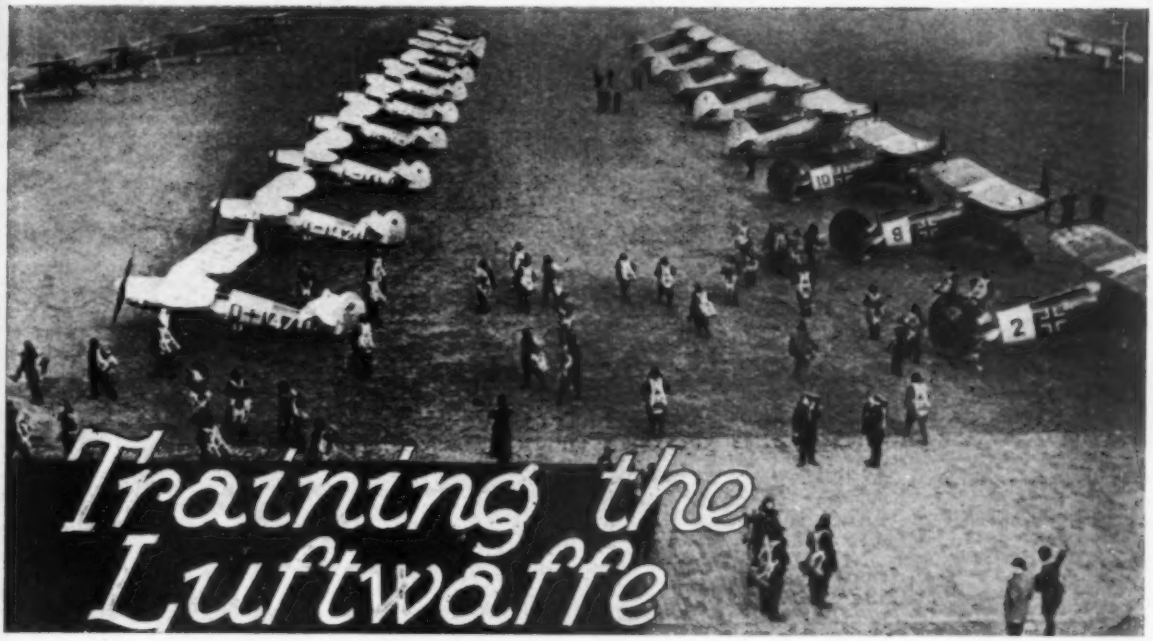
FIVE hundred little orphans whose fathers have made the Great Sacrifice are to be supported for at least five years by members of the American Expeditionary Force stationed in Great Britain and Northern Ireland.

This scheme, which is patterned on the action of U.S.A. soldiers during the first world war who made the well-being of war orphans in France their responsibility, has the full blessing and approval of Lt. Gen. Eisenhower, U.S. Commander in the European theatre of operations.

Uncle Sam's large-hearted doughboys are set upon bringing practical help to the children of fallen or severely crippled British sailors, soldiers and airmen and of men of the anti-blitz services.

Basis of this aid is a War Orphan Fund which has just been inaugurated in collaboration with *Stars and Stripes*, the A.E.F.'s own weekly newspaper. The fund is administered by the American Red Cross, which is bearing all administration expenses.

The programme calls for each child to have £20 per year raised for its benefit, or £100 as an entire amount.



Training the Luftwaffe

Pre-military Training : The Selection for Commissioned Ranks : Reduced Standards : The Staff Officers : Types of Equipment : Problems of Supply

By V. L. GRUBERG

IN no other branch of service have the Nazis established themselves so firmly as in the *Luftwaffe*. This was not only because, with the advance of the Nazi Party to power, the *Luftwaffe* was openly and officially established and placed under Goering's orders, but also because in the years prior to 1933 it was the Nazi Party which had created a semi-military organisation for flying, and thus managed to build up a cadre of Nazi-minded and drilled youth for the *Luftwaffe*.

To ensure a constant flow of "human material" the policy of the *Luftwaffe* has always been based on the principle, "Catch them young." In a decree issued by Hitler on April 17th, 1937, the N.S.F.K. (National Socialist Flying Corps) was recognised as the main body to which the task of securing young cadres for the *Luftwaffe* was entrusted. The Commandant of the N.S.F.K., General Fr. Christiansen, who served with the German Flying Corps during the last war, carried out a wide programme of organisation in which training started at the age of seven. A pre-military flying training system was thus developed in conjunction with other youth organisations, aimed to direct even the youngest of Germany to the *Luftwaffe*.

This training begins in the so-called *Jungvolk*, a pre-military children's organisation, where model construction is the main occupation, and elements of flying are simply explained. At the age of 12 the Nazi boy passes on to the Hitler Youth Flying Section, where he continues with model construction in a more advanced manner from miniature to full-scale models.

Catch Them Young

German experts consider that this occupation has a most profound bearing on the development of the future member of the *Luftwaffe*, since it grips his interest, trains him to use his hands, and conveys to him elementary aeronautical knowledge. Moreover, it is stated that, because of the careful watch kept on the young boys, a gradual selection is made possible. In the words of Col. v. Bülow, the Inspector of the N.S.F.K., "The model constructors of to-day are the fighter pilots of to-morrow."

Another important subject in the Hitler Youth Flying Sections is gliding. But actual gliding is preceded by courses in the construction of gliders designed to produce skilled cadres of youth for Germany's glider production.

At the age of 14 practical gliding begins and covers the prescribed curriculum for the A, B and C licences. Separate courses are also held in maintenance, wireless, parachute

FOR ADVANCED TRAINING : The Arado Ar 96B, powered with Argus As 410A engine, has a maximum speed of 211 m.p.h. at 9,840ft., and climbs to that height in 10.3 min.

TRAINING THE LUFTWAFFE

maintenance, etc. At the age of 16 the N.S.F.K. is ready to take the boy into its fold, where elementary power-flying is practised.

Apart from these organisations based on part-time work, certain schools exist where the training of pupils for future *Luftwaffe* officers is a full-time curriculum. Thus at the Institute for National Political Education at Potsdam there is a special section where, in addition to general subjects, boys between 15 and 17 are instructed in aeronautics, air photography, navigation, and, most important of all, gliding, the latter terminating in a glider pilot's licence. Some graduates of this school are reported to be serving with the *Luftwaffe* as second lieutenants.

Until recently, the primary condition for a permanent commission with the *Luftwaffe* was a definite Nazi past; that is, membership of the *Jungvolk*, of the Flying Section, of the Hitler Youth, and of the N.S.F.K. In other words, the candidate for an officer's career in the *Luftwaffe* had to satisfy the authorities of his continuous affiliation to the Nazi Party and its flying activities since the age of eight.

From these organisations the *Luftwaffe* could adequately draw a constant supply of officers; the economic security of the job and the financial advantages of extra pay in the *Luftwaffe* have also exercised their spell and helped recruiting.

Permanent Commissions

The career of both N.C.Os and Officers of the *Luftwaffe* has been strictly mapped out in precise regulations. But with the cumulative effect of losses in personnel serious modifications have been made. Under a new system candidates for N.C.O. rank with the *Luftwaffe* are accepted at the age of 17 and have to sign on for 12 years. Selected volunteers are sent to special schools for a period of ten to 12 months, where a general military training and instruction in general knowledge are given. They pass out as L.A/C. and are posted to a unit. After attending at different courses during the following two years, they are promoted to corporal. Generally speaking, their training is more thorough than that of other recruits.

As already mentioned, professional officers of the *Luftwaffe* are mainly drawn from the youth which went through the *Jungvolk*, the Hitler Youth and N.S.F.K. flying training. At the age of 17 the future *Luftwaffe* Officer who went through such training has indeed had an elementary grounding; if his *curriculum vitæ* shows that his past has been on the prescribed lines, the acceptance into the *Luftwaffe* is merely a formality. Upon being selected for training for a permanent commission with the *Luftwaffe* the prospective officer begins his career, organised on the following lines:—

At first a course of about six months (lately reduced to half this time) is given at an elementary flying school at which the prospective officer serves with the rank of an ensign (*Fahnenjunker*). Specialised training in the different branches of the *Luftwaffe* begins with the completion of this course and extends for a period of about nine months. The next step is a transfer to an air war school which culminates with an officer's examination. A further specialisation can follow in one of the schools for fighter pilots, dive-bombers, night fighters, fighters, bombers, etc.

Reduced Standards

This summer, however, it became evident to the leaders of the *Luftwaffe* that to replenish the seriously thinned cadres of officers, the sources of supply must be widened. Accordingly, in June, 1942, an appeal was made to pupils of the 6th to 8th forms of German high schools to volunteer for training for permanent commissions in the *Luftwaffe*. Pre-military training described above, while given preference, was not mentioned as an essential condition. With the increase in losses these measures proved insufficient and further concessions had to be made. Later it was officially announced that no minimum standard of education was required for applicants for commissioned ranks in the *Luftwaffe*, and good physique and 100 per cent. German blood were enough.

In peacetime the passing of the officer's examination carried with it the promotion to the rank of second lieutenant, and marked the beginning of the officer's career. While formerly promotions were time-tabled to require five years' service to the full lieutenant and a further five years to captain rank, this rule was not strictly adhered to in peacetime, and even less so under present war conditions. Those showing special abilities are sent for an initial course at the Air War Academy at Berlin-Gatow.

This is commanded by Major General Dr. Knauss, an "old-timer" who served in the last war and was later a Director of the *Lufthansa*. He is known for having organised and accomplished the first direct flight from Germany to China. In 1935 he joined the *Luftwaffe* and was entrusted with the training of staff officers. During a period of a few months, instruction is given here in strategy and tactics, and in advance aeronautical subjects. The officer is then posted back to a unit and only on promotion to major's rank can he be transferred back to the Air War Academy to train for the career of a General Staff Officer.

The six months' course at the Air War Academy is designed to train the officer for his future duties, and extensive tuition is given in strategy, administration, planning, etc. The conclusion of this course is marked by a stiff examination, which leads to an appointment as Staff Officer with one of the *Luftwaffe* Air Fleets.

While most of the leading officers of the German Air Force have not gone through this gradual specialised training but have been taken over from the *Reichswehr*, the younger ones, who are gradually carrying more and more weight in the affairs of the *Luftwaffe*, are the product of the new school. Under the German military system, which attaches to the staff officer

THE FLYING CLASSROOM: Old Ju 52, land and sea versions, are used for training of observers, navigators and wireless operators.

considerable responsibility and authority, this is a most significant development. But the strictly mapped out selection and training of staff officers is not followed rigidly under war conditions.

Experience and special ability in combat have brought quite a number of *Luftwaffe* officers not only a rapid promotion but an advance to staff rank. The shortage of staff officers from which the *Luftwaffe* suffers has been also responsible for a more elastic application of rules, and has considerably reduced the standards of both selection and training.

Training Equipment

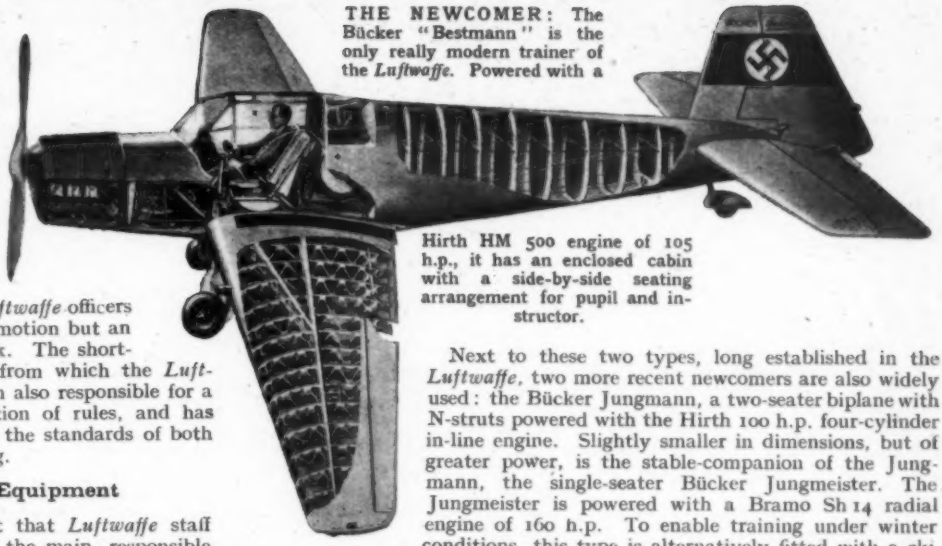
There is no doubt that *Luftwaffe* staff officers who were, in the main, responsible for the planning of operations, have displayed thorough skill and knowledge of their job. With the expansion of the air war and the initiative gone over to powerful Allied Air Forces, their task becomes wider and at the same time more complicated. Taking into consideration the German methods of organisation, future strategy and operations of the *Luftwaffe* may yet reflect the shortcomings of the new staff officers.

The demand for simplification and easy exchange of parts played an important role in the selection of training aircraft for the *Luftwaffe*. Since in training the rate of damage is high, German constructors are expected to have structural elements interchangeable with other types. German aircraft works supplying the *Luftwaffe* with trainers are to-day reported to be in a position to employ the same spare parts for different types of aircraft of their manufacture.

With the vast losses in personnel suffered by the *Luftwaffe* and the consequent cutting down of training, these demands for quick replacements have lately been given even more prominence.

For the initial training, radial engines are given almost exclusive preference because of the ease of maintenance in the air and on the ground. In these early stages of tuition of *Luftwaffe* pilots, biplanes such as the Focke-Wulf Fw 44 and Heinkel H 72 "Kadett" are used. Both these aircraft are of mixed construction, and are powered with the Bramo Sh 14—a radial engine of 160 h.p.

STILL GOING STRONG: The Klemm KL 35, powered with a Hirth engine of 100 h.p., is one of the standard trainers.



THE NEWCOMER: The Bücker "Bestmann" is the only really modern trainer of the *Luftwaffe*. Powered with a Hirth HM 500 engine of 105 h.p., it has an enclosed cabin with a side-by-side seating arrangement for pupil and instructor.

Next to these two types, long established in the *Luftwaffe*, two more recent newcomers are also widely used: the Bücker Jungmann, a two-seater biplane with N-struts powered with the Hirth 100 h.p. four-cylinder in-line engine. Slightly smaller in dimensions, but of greater power, is the stable-companion of the Jungmann, the single-seater Bücker Jungmeister. The Jungmeister is powered with a Bramo Sh 14 radial engine of 160 h.p. To enable training under winter conditions, this type is alternatively fitted with a ski undercarriage. The skis are automatically adjustable to the required angle and the tail is fitted with a controllable skid.

The Klemm KL 35, which was very popular in Germany before the war, has for some time now been employed in the *Luftwaffe* training centres. The Klemm KL 35 is a low-wing cantilever monoplane two-seater, powered with a Hirth in-line engine of 100 h.p. The centre-section of the wing is a welded steel tube construction with the fuselage, while the outer main planes and tail unit are in wood. The aircraft can be fitted with wheel, ski, or float undercarriage.

Few Recent Types

A more recent addition to the equipment of the training schools of the German Air Force is the Bücker Bü 181 "Bestmann," produced by the Bücker Flugzeugbau G.m.b.H. during the present war. The Bücker Bü 181 "Bestmann" is a low-wing cantilever monoplane with a 4ft.-wide cabin, allowing side-by-side seating of instructor and pupil. Seats are adjustable and an adjusting device for the pedal controls can be operated during flight.

The "Bestmann" can be safely stalled, and recovers with free controls from a spin. Special attention was paid to good visibility and to making the machine manœuvrable and quickly responsive to the controls. Wings are in wood, the front section of the fuselage in steel tube construction and the rear section in wood. Tail unit is a fabric-covered wood construction.

Powered with an air-cooled 4-cylinder in-line Hirth HM 500, developing 105 h.p. at 2,500 r.p.m., the aircraft is capable of an average speed af 125 m.p.h. with a flying weight of 1,681 lb. Throttled down to 112 m.p.h. it has a range of 520 miles. Span, 33ft., length 27ft. 9in., height 6ft. 6in., wing area 145 sq. ft., power loading 11.22lb/h.p., landing speed 43.49 m.p.h. With a full load, the "Bestmann" climbs in 5.3 minutes to 3,200 ft., in 12.2 minutes to 6,400ft., and to 9,800ft. in 21.8 minutes. The fuel consumption at 124 m.p.h. is 2.88 gall./hr.

Because of its robust construction, the "Bestmann" is widely employed for training German dive-bomber pilots. According to the latest available information the aircraft is stated to be capable of a diving speed up to 210 m.p.h.

In advanced training the Arado Ar 66, a biplane powered with an Argus As 10 eight-cylinder engine of 240 h.p., originally employed for this purpose, was abandoned and replaced by the Arado Ar 96B. This is an all-metal cantilever cabin monoplane with a retractable undercarriage and landing flaps.

The Arado Ar 96B has an all-metal monocoque fuselage of oval section. The wings are bolted to the lower side of the fuselage in a manner facilitating the building-in of

TRAINING THE LUFTWAFFE

engines of a higher power output. The undercarriage retracts under the wings. A Plexiglass screen in the floor, by the observer's seat, allows for good visibility for aerial photography and bomb-sighting.

The aircraft is powered by an air-cooled 12-cylinder inverted "V" Argus As 410A engine of 360-450 h.p. driving an Argus v.p. airscrew. It has a span of 36ft., length 29ft., and a wing area of 182 sq. ft., weight empty is 2,644 lb., and flying weight 3,800 lb. The armament of the Ar 96B consists of one or two fixed machine guns for the pilot (one machine gun with 500 rounds or two firing 250 each), and one flexible machine gun (375 rounds) and six 10 kg. bombs released by the observer. In addition, air photography equipment can be carried. The observer's flexible gun can be only carried while his section of the cockpit remains uncovered.

Advanced Training

In the transition stage to multi-engined aircraft, the twin-engined Focke-Wulf Fw 58 "Weihe" (Consecration) is used in *Luftwaffe* training schools. This is a low-wing monoplane of a high aspect ratio, powered with two Argus As 10C inverted Vee engines of 240 h.p. The fuselage is in welded steel, covered with fabric. Wings are in three sections. The centre part carries engines and undercarriage and is integral with the fuselage. Outer sections of trapezoid shape are attached by three fittings and have pronounced backsweep. A single girder-spar is stiffened by a sheet-covered leading edge, the remainder of the wing being covered with fabric. In each inner wing, on both sides of the fuselage, one fuel tank of 37 gal. is carried. Tail unit surfaces are fabric covered over light metal profiles. The undercarriage is hydraulically retractable.

The Fw 58 is employed not only to adapt pilots to twin-engined aircraft, but also for training in blind and night flying, wireless operations, and in air gunner and bombing schools of the *Luftwaffe*. For this latter purpose a special version is used, with a longer nose in which a forward gun-ring and a position for prone bombing is provided. Another gun position is built into the top of the fuselage, behind the pilot's cockpit.

In conformity with the demands of the *Luftwaffe* for multi-purpose application and for quickly interchangeable parts, the Fw 58 can be changed from one version with a rounded nose to the other with a longer nose by the simple operation of a few bolts.

The aircraft has a span of 68ft. 11in., length 45ft. 10in., and a height of 14ft. The wing area is 436 sq. ft. Powered with the already mentioned Argus 10C engines, the aircraft has a maximum speed of 153 m.p.h. and a landing speed of 50 m.p.h. It climbs to 3,280ft. in 3.9 minutes, to 6,560ft. in 8.7 minutes, and to 13,120ft. in 24.6 minutes. Service ceiling is 15,750ft., or 5,270ft. on one engine. Range 397 miles.

Finally, yet another Arado type forms an important part in German training equipment. This is the Arado

A VETERAN: The Bücker Jungmann, powered with a four-cylinder Hirth engine of 100 h.p., has for many years been widely used for initial training.

FOR THE TRANSITION: The Focke-Wulf Fw 58, powered with two Argus As 10C engines of 140 h.p. each, is used for training on twin-engined types.

Ar 199, employed in air-training centres of the German Navy. The Arado Ar 199 is a twin-float, low-wing all-metal monoplane, powered with an Argus As 410C inverted "V" in-line engine of 380-450 h.p. The cabin section of the fuselage is constructed in steel tubing, and the rear section is of the monocoque type. The cabin is suitably raised and gives the instructor and pupil a good field of vision. Side-by-side seating is arranged, with one additional seat in the rear for a wireless operator.

The Arado Ar 199 has a span of 41ft., a length of 34ft. 5in., and a height of 14ft. 3in. Wing area is 325 sq. ft. It climbs to 9,840ft. in 11 minutes, and the ceiling is 21,325ft. At 9,000ft. it develops a speed of 161 m.p.h., and the landing speed is 50 m.p.h.

This aircraft, which can also be launched from catapults, is not only used for the initial and advance training of naval pilots but also for the training of naval wireless operators.

A description of the training equipment of the *Luftwaffe* would be incomplete without mentioning a word about the Ju 52. A special version of this type, called by the Germans the "classroom," is used for the training of wireless operators and navigators. It accommodates eight trainees seated on four benches along the cabin walls, with the instructor in the pilot's compartment.

On the whole, the training equipment of the *Luftwaffe* is thus mainly composed of types developed a long time ago, and, with the exception of the Bücker, no new additions were made. While it is claimed by the Germans that this is an intentional "freezing" of types, their explanation is only partial. A more weighty reason is the urgent necessity to preserve the production capacity of the aircraft industry for operational types. German losses in men and material, and the parallel growing crescendo of the Allied Air Forces, are factors which now dictate the policy of the *Luftwaffe*.

Under the pressure of war conditions the pace of flying training had to be considerably accelerated at the expense of thoroughness. Although this is, perhaps, a general feature of wartime training, it applies in a greater measure to Germany than to her enemies. For European climatic conditions are at any rate adverse to rapid training, and while training centres under the Empire Training Scheme have favourable flying weather throughout most of the year, this is not so on the European continent.

Last but not least is the problem of petrol. It is evident to-day that the fuel question in Germany is, if not critical, at least serious, as illustrated by their frantic efforts to gain the Caucasian oilfields. So long as these are not available (and the chances do not improve) Germany faces a situation in which her needs for fuel increase with the expansion of Allied offensive operations, her losses multiply, and her production remains, at best, stagnant.

It is thus very likely that, in the necessity to preserve every drop of aviation fuel, the Germans will be facing the awkward choice between the demands of operational flying and the needs of training.

IN PARLIAMENT

Attention to Submarine Centres : Interim Report on Post-war Aviation : R.A.F.V.R. and R.N.V.R. Promotions : Airfields and Agriculture : Army and Air Chiefs in Agreement

U-boat Targets

Mr. Windsor asked the Secretary of State for Air whether every opportunity is being taken to bomb the centres where U-boats are being built; and whether he will consider the suggestions sent to him by the hon. Member for Central Hull.

Sir A. Sinclair: The answer to the first part of the question is "Yes." As for the second part, my hon. Friend may be assured that the target referred to has not been overlooked.

Where the "Waaf" Shoe Pinches

Sir R. Gower asked the Secretary of State for Air what arrangements are now being made for members of the Women's Auxiliary Air Force to be supplied with service shoes of unusual sizes, in view of the fact that coupons are no longer issued to enable those who take unusual sizes to buy their shoes in civilian shops.

Sir A. Sinclair: Royal Air Force units are authorised, on production of a medical certificate, to purchase suitable shoes locally for W.A.A.F. personnel who cannot be fitted from the extensive range of sizes and fittings in Service stocks. Under arrangements made by the Board of Trade, the appropriate official form is accepted by retailers in lieu of coupons.

Civil Aviation

Mr. Perkins asked the Paymaster-General whether the Government have yet come to a decision on the Interim Report of the Inter-departmental Committee on Civil Aviation?

The Paymaster-General (Sir William Jowitt): No, Sir. The matter is still under consideration.

Mr. Perkins: Is it not a fact that the Committee is unable to function until the Government come to their decision?

Sir W. Jowitt: The Government are taking all steps possible to come to a proper decision.

Service Disparity

Wing Cdr. James asked the First Lord of the Admiralty whether it is proposed to take steps to remedy the marked disparity between the promotion and commands attained by officers of similar ages, qualifications and service experience who have joined the flying branches of the Royal Air Force Volunteer Reserve and the Royal Naval Volunteer Reserve, respectively.

Mr. Alexander: I would refer the hon. and gallant Member to the reply which I gave to the hon Member for Stroud (Mr. Perkins) on October 14th. The arrangements there referred to apply to officers of the Air Branch of the R.N.V.R.

Aircraft Accident

Mr. R. Morgan asked the Secretary of State for Air whether he can make any statement as to the disaster to P/O. Beurling's bomber while on the way to Canada, in view of the fact that it was carrying 32 people on a transatlantic flight.

Capt. Balfour: The R.A.F. aircraft in question was not engaged on a transatlantic flight, but on other transportation work. The accident occurred when attempting to land at an airdrome on the route. A Court of Inquiry has been convened to investigate the circumstances and cause. The House will, I am sure, wish to join with me in expressing sympathy with the relatives of those who lost their lives through this accident.

A.T.C. Equipment

Sir A. Knox asked the Secretary of State for Air what articles of uniform and equipment are supplied free to members of the Air Training Corps.

Sir A. Sinclair: The personal uniform issued free to A.T.C. cadets consists of tunic, trousers and cap. In addition, limited numbers of mackintosh capes are held by units for use by cadets. Equipment and publications for instructional purposes are issued to units from R.A.F. stocks as far as possible. These supplies may be supplemented by purchases from unit grants.

Naval Airfield Sites

Mr. Boothby asked the First Lord of the Admiralty whether, in selecting sites for new naval air stations, due regard is paid to the undesirability of requisitioning valuable agricultural land.

Captain Pilkington: Yes, Sir.

Mr. Boothby: Can my hon. and gallant Friend say whether, in the recent case to which I directed his attention, he is satisfied that the very valuable stretch of land which he is taking over for the purpose of establishing a training school is necessary for the war effort, and that no alternative site could be found for this purpose.

Captain Pilkington: Yes, Sir. It was with the greatest reluctance that we took this particular piece of ground, and I can assure my hon. Friend that every possible alternative site was considered first.

Mr. Austin Hopkinson: May we have an assurance that the efficiency of the Fleet Air Arm will be regarded as paramount to every other consideration.

Captain Pilkington: Yes, Sir, I agree that that is the most valuable consideration we have to take into account.

Retirement of R.A.F. Officers

Colonel A. Evans asked the Secretary of State for Air to what extent it has been customary during the war to place an officer of the Air Force on the retired list when charges have been made against him, which he has repudiated, and has had no opportunity of answering before a properly constituted court.

Sir A. Sinclair: Both in peace and in war the services of an officer may be dispensed with without court martial if the circumstances attending the charges against him make it clear that his retention in the Royal Air Force is undesirable. In every such case, the officer concerned is given an opportunity of making a statement which is carefully considered before a decision is reached. An officer who feels himself aggrieved has the right of appeal to the Air Council under Section 42 of the Air Force Act. I am satisfied that these arrangements, which are similar to those in force in the other Services, are equitable.

Technical Books

Mr. Colegate asked the President of the Board of Trade whether he is aware of the unsatisfactory position of the supply of technical books; and whether he is prepared to arrange the supply of paper to publishers in such a way that all standard technical books may be available in sufficient quantities for students at technical schools and colleges?

Mr. Dalton: As my hon. Friend was informed by my right hon. Friends the Minister of Labour and the President of the Board of Education, on 19th November, while there has necessarily been some reduction in the publication of technical books, there appears at present to be no serious shortage of such books. Special arrangements have already been made to assist the publication of books of particular importance to the war effort, including technical books, and I am considering further measures for increasing the supply of these types of books.

Army Air Co-operation

Capt. C. S. Taylor asked the Prime Minister whether he is satisfied that there is complete agreement on the general principles of Army air co-operation between the Chief of the Imperial General Staff and the Commander-in-Chief Home Forces and the Chief of the Air Staff; and that training in this direction is now proceeding satisfactorily in this country?

Mr. Attlee: I know of no disagreement between the officers mentioned on the general principles of Army air co-operation, namely, its importance and the need for it to be as close as possible. With regard to the second part of the Question, I would refer my hon. and gallant Friend to the answer I gave to a similar Question by him on 28th July last. I would add that the lessons of the recent operations in the Middle East, in which Army and Air co-operation was a model, are being closely studied, and we shall soon have the assistance of Air Chief Marshal Sir Arthur Tedder in this connection.

Incapacitated N.C.O.s' Rank

Mr. Touche asked the Secretary of State for Air whether he is aware of the anxiety caused to Royal Air Force non-commissioned officers on operational duties by the fact that in the event of being temporarily incapacitated by wounds or illness they are liable to forfeit their rank, which both involves loss of pay and is liable to be misunderstood by the public, whether he can make a statement on the subject.

The Secretary of State for Air (Sir Archibald Sinclair): My hon. Friend is, I think, under a misapprehension. Airmen who are temporarily withdrawn from air crew duty on account of wounds or illness do not forfeit their rank.

Correspondence

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

CONSERVATION OF FUEL

Practically "In the Bag!"

MAY I suggest an alternative to that of "Derby" in the issue of November 5th?

The test bed sites should be located in the north-west corner of Scotland. The engines would drive normal-type fans, and the air from them would be driven into huge elastic bags or containers after the pattern of gasometers.

On the approach of a depression from Iceland the stored air would be released to fill up the hole, and fine weather would continue.

Any questions? "ST. LEGER."

LOOKING AHEAD

Twin Booms for Jet Propulsion

I READ keenly your theories as regards aviation of the future in *Flight* of November 26th. Emphasis was laid upon the importance of jet propulsion, and it is evident that the possibilities of this system are being thoroughly investigated as a result of the advent of the Caproni-Campini C.C.1.

Mr. Poulton has given an imaginative impression of the principle of jet propulsion incorporated in an air-liner of the future, but may I suggest a more practical layout for such a purpose? If the jet propulsion tubes and compressors were isolated in twin booms (or hulls if it were a seaplane), and the passengers, freight and crew were accommodated in a nacelle between these twin booms, we should have several distinct advantages. First, the principles of jet propulsion demand that the tube should extend in a straight line from the nose of the hull to the tail. This naturally takes the central space in the fuselage, and necessitates great bulk in the design of the plane in order to accommodate the passengers and freight; this difficulty would be overcome with twin booms. Secondly, considerable heat is required to obtain sufficient air pressure prior to expulsion through the jet; such a temperature, together with the sound and vibration of the engines would inconvenience passengers. Thirdly, greater power would be achieved by having two jet propulsion tubes instead of one, and, finally, the plane would achieve greater speed and beauty through the possibilities of better streamline. A. M. HARRIS.

Speed the Raison D'être of Air Travel

FLIGHT is showing a commendable interest in the possibilities of post-war civil air transport development, and doubtless the articles in the current issue are intended more as "feelers" to invite discussion than as definite statements of editorial opinion. The artists' conceptions featured are certainly provocative.

To criticise these "designs" on matters of technical detail, as you point out, would be unfair. But the basic principle behind each of them—the policy of the luxury liner with wings—is very vulnerable to attack.

The advantages of air transport, in the last analysis, boil down to sheer speed. One might even call speed the *raison d'être* of air transport. Obviously, then, if the object is to cut down the time required to cover the trunk routes of the world, cinemas and bathing pools would be superfluous.

If it takes six weeks to get to Australia by sea, then the need for entertainments is a very real one, but with the high velocity hops of air travel, luxury provision beyond the super-Pullman standard is unnecessary.

For aerial freight carrying, size up to and perhaps a little beyond the Mars scale is an asset. But freight carrying should be the duty of a specialised type of aircraft, and passenger machines should not be expected to carry load of this nature, except, of course, for passenger luggage.

The crux of the flying boat *v.* landplane controversy is the question of landing and take-off, because it is only on this point that the flying boat has any real advantages. Perhaps the solution will be found in the use of aircraft (in the true sense of the term, being neither "landplane" nor flying "boat") having assisted take-off from powered floats as suggested by a *Flight* contributor some time ago.

A. CONWAY.

AIRCRAFT PROPULSION SYSTEMS

Possibilities in the Gas Turbine

THE very interesting articles on Aircraft Propulsion Systems published in your issues of October 15th and 22nd prompt me to write to you concerning some proposals I have been considering for about 20 years. The serious difficulty with hot air turbines has always been the limited temperature range available with present materials, which leads to low overall efficiency. After compression the air temperature will probably be in the neighbourhood of 300 degrees C., while 1,000 degrees C. is the probable practical maximum temperature after burning, with the turbine effluent at about 500 degrees C. This gives us a maximum theoretical efficiency of no more than 50 per cent. The various losses associated with compression and later expansion in the turbine reduce the possibilities to somewhere in the neighbourhood of 20 per cent.

In the articles referred to, the author has made it plain that the proposals for aircraft gas turbines are at the moment following closely the current practice for stationary installations. It is on this point that I would like to offer some suggestions.

First, the aircraft is essentially a dynamic machine and the fact that the air supplied to the compressor intake is travelling at a high speed because of its relative motion with the plane should be a major factor in design.

Secondly, the exhaust from the turbine will also be travelling at high speed and by proper design can be made to contribute materially to the tractive effort.

Thirdly, it appears probable that the air intake into the compressor will be of materially greater volume than that displaced by the propeller. It is certain that the compressor will absorb between four and five times the surplus available to the propeller, which suggests in its turn that it might be possible to design the power unit to operate without a propeller as usually understood, the front row of blading being in effect the propeller.

It is thought that a unit designed on this basis will show a greater tractive effort per lb. of fuel and per lb. weight of engine than the present standard designs, bearing in mind that the propeller is a comparatively inefficient instrument.

Fourthly, it is a major point in favour of gas turbines that they will burn almost any type of fuel, solid fuel of the pulverised coal type appears to be a distinct possibility.

Fifthly, it is clear that big weight economies may be achieved by using light weight alloys in the compressor blading and casing, while the expensive heat-resisting steels should only be required by a part of the front end of the turbine.

I feel very strongly that the gas turbine has a very big field in front of it in aircraft propulsion, and that not the least of its advantages will be a substantial reduction in the noise produced. A. HUDSON, B.Sc., A.M.I.E.E.

BOOST PRESSURE VARIATION

"The Law of Supply and Demand"

I READ with interest in your Correspondence columns of the November 19th issue the reference to boost pressure variation. Surely the reason is as follows:—

(1) Really the law of supply and demand.

(2) Assume the aircraft is going at a constant speed in high revs., i.e., fine pitch, and the control is moved to low revs., i.e., coarse pitch, with throttle and mixtures controls not touched, then an increase in boost may take place.

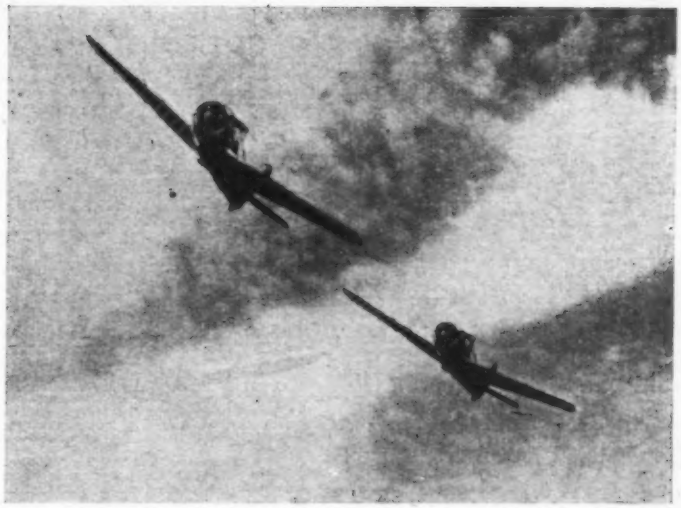
(3) The throttle not having been moved, the suction aperture to the blower remains constant, but due to the coarser pitch reducing the crankshaft speed so the outlet from the blower is restricted and more pressure is consequently built up in the manifold.

(4) The coarse pitch will increase the speed of the aircraft and this increase will slowly raise the engine speed a little. Combining these two factors more effect on the air intake will be given and help to increase the boost.

I should be pleased to hear other views on this subject through your journal if it is possible to give it space, as I have found many people puzzled by this. The above is an explanation that I was taught a long time ago. F. ASHLEY.

Service Aviation

Royal Air Force and Fleet Air Arm News and Announcements



FOR THE DUCE'S DOG FIGHTS? : A number of Focke Wulf FW 190 squadrons are being moved to the south of Italy to counter the R.A.F. over "bomb alley."

Promotions

The London Gazette, November 27th, 1942.

EQUIPMENT BRANCH.

Group Captains to be Air Commodores (temp.): November 1st, 1942, W. Thorne, C.B.E.; T. E. Brownley, O.B.E.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

DISTINGUISHED SERVICE ORDER

Act. Sqn. Ldr. G. H. EVERITT, D.F.C., R.A.F.V.R., No. 50 Sqn.—Sqn. Ldr. Everitt, Flt. Sgt. Macdonald and Sgt. Wolton were captain, wireless operator and flight engineer respectively of an aircraft detailed to attack a target in Western Germany one night in October, 1942. Whilst over the target area, the aircraft was hit by anti-aircraft fire, and petrol began to leak from one of the fuel tanks. Nevertheless, Sqn. Ldr. Everitt pressed home an accurate bombing attack.

In the face of great difficulties, Sqn. Ldr. Everitt, excellently supported by Flt. Sgt. Macdonald and Sgt. Wolton, whose wireless and engineering skill were of the greatest assistance, succeeded in flying the damaged aircraft back to this country. In appalling weather, Sqn. Ldr. Everitt effected a masterly emergency landing at an airfield at the second attempt. Subsequently, Sqn. Ldr. Everitt flew with distinction in the attacks on Le Creusot, Genoa and Milan.

Flt. Lt. F. T. COLLINS, R.A.F.V.R., No. 462 Sqn.—One night in October, 1942, this officer was the navigator of an aircraft detailed to attack Maleme airfield, Crete. Whilst over the target area, the aircraft was hit by fire from the ground defences and Flt. Lt. Collins, who was lying in the bomb aimer's position, was severely wounded. Both feet were almost severed at the ankles; he also sustained two serious wounds in the lower part of his back and several smaller wounds in other parts of the body. Although so seriously injured he refused morphia until he was satisfied that his aircraft was being flown on a correct course. Afterwards he directed his captain for some hours, until friendly territory was reached.

Act. Flt. Lt. A. L. WIGGINS, R.A.A.F., No. 38 Sqn.—At dusk one evening in October, 1942, this officer led an unescorted section of bombers to attack an enemy supply convoy off Tobruk. In the face of heavy defensive fire from escorting destroyers and shore batteries, Flt. Lt. Wiggins secured two hits on an enemy merchant vessel of 6,000 tons, causing its destruction.

Wing Cdr. J. B. RUSSELL, No. 172 Sqn.—This officer has performed an arduous task in training the squadron he commands in methods of attack against U-boats. On one occasion on a flight over the Bay of Biscay, Wing Cdr. Russell executed a skilful attack on a submarine surfaced on the water.

F/O. W. D. LITSTER, R.A.F.V.R., No. 223 Sqn.—In October, 1942, this officer was the observer of the leading aircraft of a formation detailed to attack a landing ground near Daba. When near the target an intense and accurate defensive barrage was encountered, but, in spite of this, the objective was heavily bombed. F/O. Litster was severely wounded when his aircraft was hit by anti-aircraft fire. His left arm was almost severed, while he suffered other wounds in his head and body. He was unable to speak to his pilot, as the intercommunication was unserviceable. Displaying great fortitude, F/O. Litster wrote instructions setting out the course for base and contrived to pass them to his pilot.

Act. Wing Cdr. G. P. GIBSON, D.F.C., No. 106 Sqn.—Since being awarded a bar to the D.F.C. this officer has completed many sorties, including a daylight raid on Danzig and an attack at Gdynia. In the recent attack on Le Creusot, Wing Cdr. Gibson bombed and machine-gunned the transformer station nearby from 500 feet. On October 22nd, 1942, he participated in the attack on Genoa and, two days later, he led his squadron in a daylight sortie against Milan.

Act. Wing Cdr. K. P. SMALES, D.F.C., No. 44 Sqn. This officer has completed a large number of sorties. On the night of October 22nd, 1942, he piloted an aircraft detailed to attack Genoa. Despite engine trouble, which developed on the outward flight, he continued his mission and, displaying fine airmanship, reached his objective and bombed it. Engine trouble persisted on the return journey but he flew the aircraft back to base safely.

BAR TO DISTINGUISHED FLYING CROSS.

Flt. Lt. D. E. HAWKINS, D.F.C., No. 240 Sqn.—Flt. Lt. Hawkins is employed as captain of Catalina aircraft. In June, 1942, he pressed home a heavy attack on a submarine in the face of heavy defensive fire. After releasing his bombs, he machine-gunned the submarine's crew and silenced the forward gun. The submarine submerged but, soon after, it re-surfaced and remained stationary. Its crew came up on deck and surrendered. Later the submarine sank by the stern.

Flt. Lt. H. G. POCKLEY, D.F.C., R.A.A.F., No. 10 Sqn.—This officer is an outstanding pilot and captain. Within the last six months he has destroyed two and damaged three U-boats, destroyed one R boat and damaged a 6,000-ton merchant vessel.

Wing Cdr. J. DARWEN, D.F.C., No. 234 Sqn.—In October, 1942, this officer participated in a low-level attack on a landing ground near Daba. Wing Cdr. Darwen pressed home his attack with great vigour and probably destroyed two enemy aircraft and a vehicle on the ground with machine-gunfire. He flew so low that the propeller of his aircraft struck the ground. Although his aircraft was damaged, Wing Cdr. Darwen skilfully led his formation from the target area in spite of interference by fighters. Later he was forced to make an emergency landing in the desert, but was rescued the next day by one of our armoured cars.

500 ft. Over Le Creusot

Act. Flt. Lt. E. A. DEVERILL, D.F.C., D.F.M.—Since being awarded the D.F.C. this officer has taken part in many sorties, including many attacks on targets in the Ruhr area. In the daylight attack on the transformer station near Le Creusot, Flt. Lt. Deverill bombed his objective from a height of only 500 feet. He also participated in the recent raids on Milan and Genoa.

P/O. M. E. WALSH, D.F.C., R.A.F.V.R., No. 57 Sqn.—This officer has participated in numerous sorties, including attacks on Duisburg, Hamburg, Essen and, more recently, in the raids on Le Creusot, Genoa and Milan. On the last occasion he accomplished fine work and secured some excellent photographs.

DISTINGUISHED FLYING CROSS.

F/O. D. M. SLEEP, R.A.F.V.R., No. 224 Sqn.—One day in October, 1942 F/O. Sleep and Sgt. Lenson were captain and flight engineer respectively of an aircraft which engaged a U-boat far out in the Atlantic. During the attack an explosion, caused by what appeared to be a hit on the submarine, severely damaged the aircraft. It went into an almost vertical climb, but, with a great effort, F/O. Sleep recovered control, and manœuvred to observe the result of his attack. It became necessary to jettison the remaining bombs, but, to accomplish this, they had to be man-handled. Regardless of his own safety, Sgt.

PRODUCER AND USER: Lord Beaverbrook—one-time Minister of Aircraft Production—leaving Buckingham Palace with his son, Wing Cdr. the Hon. Max Aitken, who had been decorated by the King with the D.S.O.

SERVICE AVIATION

Lenson performed the task, and, for 1½ hours, he worked on the narrow catwalk with the bomb doors open in order to release the bombs; the catwalk was extremely slippery, and Sgt. Lenson had to shed his boots and socks to enable him to obtain a firm grip.

On reaching this country, F/O. Sleep executed an emergency crash-landing at night with great skill. On impact, however, the aircraft caught fire, but Sgt. Lenson succeeded in extricating an injured comrade from the burning aircraft.

F/O. G. W. N. BASSINGTHWAIGHTE, R.A.A.F., No. 113 Sqn.—As pilot and wireless operator-air gunner respectively F/O. Bassingthwaighte and Sgt. McKerracher flew in the leading aircraft of a section of bombers detailed to attack shipping at Akyab. Whilst over the target area, the aircraft was repeatedly attacked by enemy fighters, but, in spite of this, F/O. Bassingthwaighte executed a most determined attack from a low level. During the engagement Sgt. McKerracher was slightly wounded, but he used his gun most effectively. Both these members of air crew have completed numerous sorties.

P/O. E. F. G. HEALEY, D.F.M., R.A.F.V.R., No. 106 Sqn.

P/O. J. R. PENNINGTON, R.A.F.V.R., No. 106 Sqn.

P/Os. Healey and Pennington and Flt. Sgt. Crozier were pilot, navigator and air bomber respectively of an aircraft engaged in recent sorties against Le Creusot, Genoa and Milan. On all occasions they achieved much success and each, in his respective role, displayed a high standard of skill and determination.

Intruder Radio

P/O. J. GRANT, No. 18 Sqn.—As wireless operator-air gunner this officer has participated in numerous operational missions. On one occasion in June, 1942, during an intruder sortie over an enemy airfield, his skilful work was of the greatest assistance to his pilot and contributed materially to the success of the operation. On another occasion, during an air sea rescue sortie, his outstanding wireless skill was largely responsible for the success achieved.

F/O. H. W. SOUTHGATE, R.A.F.V.R., No. 50 Sqn.—This captain of aircraft has consistently shown the greatest determination in seeking out his targets, and, no matter how fierce the opposition, he has attacked at low altitude, thereby persistently scoring hits which have been confirmed by photographs.

Act. F/O. H. A. M. WOODHATCH, R.A.F.V.R., No. 73 Sqn.—This officer has an excellent operational record, and has shown competence and skill as a heavy bomber pilot. Although involved in a serious crash, his keenness is undiminished.

P/O. E. A. F. DE BARTOK, R.C.A.F., No. 101 Sqn.—This officer has a splendid operational record as a pilot. He is keen and persevering when pressing home his attacks, regardless of opposition. In August, 1942, P/O. de Bartok took part in a daylight raid on Emden. Despite nine attacks on his aircraft by a Me 109, and on the return journey being shadowed by three other enemy aircraft, by his skilful evasive action he brought his aircraft back to base undamaged.

P/O. W. R. BROOKS, R.A.F.V.R., No. 142 Sqn.—Throughout his operational sorties this officer has shown an outstandingly fine example and devotion to duty of the highest order. On one occasion, despite a badly damaged aircraft, by skilful pilotage and cool judgment, he pressed on successfully bombing the target and subsequently brought his crew safely back to base.

P/O. E. R. BUTLER, R.A.F.V.R., No. 97 Sqn.—P/O. Butler has displayed great skill as a navigator in attacks against some of the most heavily defended areas in Germany. On one occasion, during a low-level daylight attack on Augsburg, despite heavy damage to his aircraft from anti-aircraft fire, this officer, displaying great determination, persisted and successfully achieved his mission.

P/O. I. T. CHAMBERS, R.A.F.V.R., No. 158 Sqn.—P/O. Chambers' standard of proficiency as a captain of aircraft has been of the highest order. He has pressed home his attacks with the utmost determination—on occasions from very low level—several times bringing home safely a damaged aircraft.

P/O. T. B. CROWFOOT, R.A.F.V.R., No. 16 Sqn.—This officer is a pilot whose technical ability is outstanding and whose operational sorties have been brilliantly successful. He has taken part in most of the recent heavy raids, including those against targets at Hamburg, Duisburg, Dusseldorf, Karlsruhe, Bremen and Saarbrucken which he bombed below cloud at 4,500 feet. On another occasion he made a mining sortie alone far into the Baltic.

P/O. A. L. DICKINSON, R.A.F.V.R., No. 106 Sqn.—Throughout his operational sorties P/O. Dickinson has displayed the greatest skill and resolution and whatever the opposition has taken his aircraft over the target to ensure accurate bombing.

P/O. V. DUXBURY, R.A.F.V.R., No. 207 Sqn.—This officer has shown outstanding keenness. Recently when detailed for an operational sortie engine trouble developed before the aircraft reached the English coast. Immediately returning to base, P/O. Duxbury, within seven minutes of landing, took off again in a reserve aircraft.

P/O. C. FODERINGHAM, R.C.A.F., No. 101 Sqn.—This officer has always displayed outstanding coolness and courage, often under very difficult conditions. One night in August when his aircraft was so severely damaged by night fighters he had to descend on the sea, and it was largely due to his leadership and presence of mind that four members of the crew were rescued. On two other occasions, by his ability and skill, he has brought his badly damaged aircraft safely to base.

Hydraulic Coffee

P/O. J. E. FRANCIS, R.C.A.F., No. 12 Sqn.—This captain of aircraft has pressed home his attacks on the enemy, letting neither anti-aircraft defences, adverse weather conditions nor minor technical defects deter him from his objective. On one occasion, when returning from a sortie, the hydraulics in his aircraft failed, but, displaying resourcefulness and ingenuity, this officer succeeded in getting enough coffee from Thermos flasks into the hydraulic system to lower the flaps, thereby reducing the risk of damage to a valuable aircraft.

P/O. H. B. HAY, R.C.A.F., No. 61 Sqn.—P/O. Hay, as navigator, has participated in some outstanding attacks on enemy targets, and has brought back some highly successful photographs.

P/O. C. D. INCE, R.A.F.V.R., No. 214 (F.M.S.) Sqn.—This officer has carried out many operational sorties and on seven occasions, on three engines, has landed his aircraft without causing damage or injury to his aircraft and crew. One night in September, while over the target area, a shell burst under the wing of his aircraft, rendering the outer engine useless. On approaching home the starboard engine failed and then the outer engine fell out of the airframe. Despite this, P/O. Ince made a successful crash landing. On another occasion, when attacked by an enemy aircraft, he skilfully manœuvred his aircraft, enabling his gunners to destroy the enemy.

P/O. R. H. KNIGHT, R.A.F.V.R., No. 405 (R.C.A.F.) Sqn.—This officer's dogged determination, skill and devotion to duty is exemplified by the fact that he has completed 20 operational sorties in two months. On one occasion, when his aircraft was badly hit by anti-aircraft fire, in the face of heavy odds, he showed courage and coolness in extricating his crew and aircraft from a perilous situation and returning with numerous photographs.

P/O. J. C. LOVELACE, R.C.A.F., No. 150 Sqn.—As wireless operator during one operation against Frankfurt his aircraft was very badly damaged by anti-aircraft fire, but P/O. Lovelace, displaying great coolness, kept the wireless functioning, thus enabling his captain to bring the aircraft safely home. On at least three other occasions when his aircraft has been badly damaged, it has been almost entirely due to this wireless operator that the aircraft has returned to base safely.

P/O. W. A. MAJOR, R.A.F.V.R., No. 115 Sqn.—P/O. Major is a highly skilful navigator who has taken photographs over some of the enemy's most heavily defended targets, several from altitudes well below 10,000 feet.

P/O. A. S. MEARA, R.A.F.V.R., No. 106 Sqn.—P/O. Meara is a navigator of the highest skill, and throughout his operational sorties has maintained an exemplary standard of accuracy. He has navigated his aircraft to such targets as Bremen, Dusseldorf, Kassel, Nuremburg and has been in all of the more recent heavy raids on the Ruhr. By his efforts he has contributed largely to the success of two mining sorties.

P/O. F. A. READ, R.A.F.V.R., No. 207 Sqn.—P/O. Read has proved himself an outstandingly successful captain, making every possible effort to locate and bomb his target.

Dead Engine Attack

P/O. J. D. V. S. STEPHENS, D.F.M., R.A.F.V.R., No. 44 (Rhodesia) Sqn.—On one occasion, while en route to the target, the port inner engine of P/O. Stephens' aircraft caught fire. This officer extinguished the flames and proceeded to attack an airfield as it was not possible to reach the primary target.

P/O. J. H. STICKELL, R.C.A.F., No. 7 Sqn.—P/O. Stickell has taken part in attacks on Essen, Hamburg, Bremen and other heavily defended targets. Throughout his captaincy and determination have been of the highest order.

P/O. I. F. TAMAGNO, R.A.A.F., No. 460 (R.A.A.F.) Sqn.—This officer's skill as a navigator has contributed largely to the many successes achieved. Displaying great determination in the face of enemy opposition, he has on several occasions successfully photographed the target area.

P/O. M. E. WALSH, R.A.F.V.R., No. 57 Sqn.—This officer has displayed great determination to succeed in his mission, whatever difficulties he may encounter. One night in August, he flew over Kassel twice at 3,000 feet and then attacked at 1,500 feet despite damage sustained to his aircraft from anti-aircraft fire. The following night he was detailed to attack Nuremburg. Crossing the enemy coast, P/O. Walsh skilfully evaded a Ju 88 and bombed the target successfully. On the return journey he was intercepted by two hostile aircraft, but by his skilful airmanship they were prevented from getting in an effective attack, although he was chased to the coast.

W/O. N. W. MACKENZIE, No. 35 Sqn.—W/O. MacKenzie has a record of fine service and devotion to duty. On one occasion, his aircraft was severely damaged while attacking Essen. By skilful airmanship he flew the aircraft on two engines to within 50 miles of the English coast where he was forced to alight on the sea.

W/O. L. OLLIER, No. 101 Sqn.—This officer took part in a daylight attack on Emden in August, 1942, pressing home his attack with determination and skill. On two occasions he has returned from attacks with one of the two engines unservicable, each time he made a landing successfully. The consistency with which W/O. Ollier locates his targets and the determination with which he presses his attacks home, irrespective of the opposition, are outstanding.

Emergency Landing

Act. Flt. Lt. C. H. RAIGENT, R.N.Z.A.F., No. 15 Sqn.—This officer has completed many sorties. During an operation against a target in Bremen, he flew over the area for a considerable time to identify his objective correctly before releasing his bombs. Although his aircraft was severely damaged by anti-aircraft fire, he flew it back to this country and effected a masterly emergency landing.

Act. Flt. Lt. E. H. MCCAFFERY, R.C.A.F., No. 15 Sqn.—This officer has participated in numerous sorties, and has displayed navigational skill of a high order. He has always shown the greatest determination to reach and bomb his target, and he has often obtained valuable photographs.

F/O. H. T. MILES, R.C.A.F., No. 15 Sqn.—F/O. Miles has completed many sorties. Although his aircraft has often met fierce opposition, he has always endeavoured to press home his attacks with accuracy.

Flt. Lt. W. D. WINWARD, No. 68 Sqn.—Flt. Lt. Winward has participated in a large number of operational sorties. This officer has been responsible for the destruction of three enemy aircraft, two of which he shot down at night.

P/O. R. RAWLINGS, R.A.F.V.R., No. 115 Sqn.—One night in October, 1942, this officer captained an aircraft which was one of a formation detailed to attack objectives in Genoa. He found the city partially obscured by low cloud, but, despite the mountainous nature of the country, he descended to 1,500 feet to release his bombs.

Act. Flt. Lt. R. GEE, R.A.F.V.R., No. 47 Sqn.—In October, 1942, this officer flew the leading aircraft of a formation which attacked an enemy convoy off Tobruk. In spite of heavy defensive fire a successful attack was completed. Flt. Lt. Gee obtained a hit on a tanker which caught fire and was destroyed. This officer has taken part in many operational sorties.

Major D. W. PIDSLEY, S.A.A.F., No. 15 (S.A.A.F.) Sqn.—In October, 1942, this officer led a formation of aircraft detailed to make a low level attack on an enemy supply convoy off Tobruk. In the face of intense anti-aircraft fire Major Pidsley gallantly pressed home the attack at mast height. He secured a direct hit on the stern of a tanker, causing a fire which destroyed the ship. Although his aircraft received severe

Air Chief Marshal Sir R. E. C. Peirse, K.C.B., D.S.O., A.F.C., who is A.O.C.-in-C. India, being greeted by the Station Commander on his arrival at an airfield in Ceylon.

damage. Major Pidsley displayed fine airmanship and flew it to a base safely.

Act. Wing Cdr. S. J. HARRISON, A.A.F., No. 120 Sqn.—During the month of December, 1941, this officer participated in shipping strikes in the Bay of Biscay, involving attacks close in-shore. On one occasion he made low level attacks on two German naval vessels, bombing and machine-gunning them. In January, 1942, he performed a 16-hour sortie during which he attacked an enemy submarine.

Act. Wing Cdr. D. F. SPOTSWOOD, R.A.F.O., No. 500 Sqn.—Since the war began, this officer has completed much operational flying both over the North Sea and the Atlantic, frequently in the worst of weather. He has executed two attacks on U-boats, one of which may have been destroyed.

Sqn. Ldr. J. BRANDT, R.A.F.O., No. 67 Sqn.—This officer is a courageous and determined leader. He has destroyed two enemy aircraft in the air as well as a number on the ground in attacks on enemy air bases.

Sqn. Ldr. MAJUMDAR, I.A.F., No. 1 Sqn.—Early this year this officer commanded the squadron during its activities in Burma. He led two unescorted attacks on enemy airfields in Thailand and attacks in support of the army in Tennasserim; he also completed valuable reconnaissances during the retirement from Rangoon to the Prome positions.

Act. Flt. Lt. C. M. OWEN, R.A.F.V.R., No. 210 Sqn.—This officer has worked extremely hard and with exceptional keenness in his duties as convoy escort. His long record of meeting and escorting convoys successfully far out in the North West approaches would be difficult to excel. Latterly, he has been engaged on long and dangerous flights in very bad weather.

Act. Flt. Lt. L. C. PIPKIN, R.A.F.V.R., No. 103 Sqn.—This air observer has displayed great skill in navigation. On one occasion when his aircraft was attacked by an enemy fighter and the rear of the fuselage was set ablaze, he beat out the flames with his bare hands and afterwards similarly extinguished flames on the tube of an oxygen bottle. Flt. Lt. Pipkin, despite severe burns thereby received, navigated his aircraft back to base.

U-boat Attack on Fire

F/O. R. N. R. GETTEMAN, R.A.F.V.R., No. 233 Sqn.—This officer is a most capable and determined pilot. He recently accomplished a highly successful attack on a U-boat surfaced on the water. Although his aircraft was hit by anti-aircraft fire, which set one of his engines on fire, F/O. Getteman continued his attack down to 50 feet and released his bombs. He afterwards flew his damaged aircraft back to base and landed safely with one engine out of action.

F/O. J. F. SWAIN, R.A.A.F., No. 200 Sqn.—In July, 1942, this officer was the captain of a Hudson aircraft which attacked a submarine in the Atlantic. The submarine, which was observed on the surface of the water, was attacked with such speed and accuracy that hits were estimated before it had time to submerge. This is the second occasion on which F/O. Swain has attacked an enemy submarine with promising results.

F/O. E. P. WALSHE, R.A.A.F., No. 202 Sqn.—Whilst acting as captain of a Sunderland flying boat during a flight one afternoon in September, 1942, this officer observed a U-boat on the surface of the sea some three miles distant. As the aircraft approached it the U-boat opened fire, but F/O. Walshe skilfully manœuvred and attacked with bombs. Two of them exploded within five feet of the U-boat's conning tower, and another two alongside its port bow. Half an hour later the U-boat began to submerge, and was seen to sink bow first, the stern protruding out of the water for several seconds. Thirty-six survivors were observed floating on the sea. This officer, whose skill enabled him to complete his attack without damage to his aircraft or injury to his crew, has always displayed exceptional ability and devotion to duty.

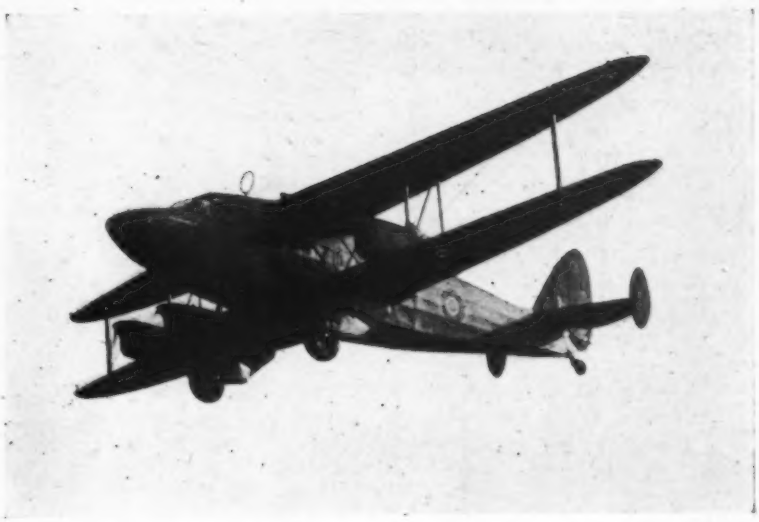
Act. Sqn. Ldr. L. J. JOEL, No. 223 Sqn.—One day in October, Sqn. Ldr. Joel flew the leading aircraft of a force of bombers which attacked enemy positions in daylight. Although his aircraft was severely damaged by anti-aircraft fire, he flew it back to base. The next day, in an attack on a landing ground, his aircraft was hit by enemy fire and his observer was seriously wounded. In the face of many difficulties, Sqn. Ldr. Joel skilfully led his formation to base and landed his damaged aircraft safely.

Act. Sqn. Ldr. I. C. STRUTT, R.A.F.V.R., No. 104 Sqn.—During an operational sortie one night in October, 1942, this officer displayed exceptional determination to complete his allotted task. In the face of heavy anti-aircraft fire he flew over the target area for some 40 minutes, pressing home his attacks and obtaining photographs. His aircraft sustained much damage, making it difficult to manœuvre, and he was unable to take avoiding action when anti-aircraft fire and searchlights were encountered on the homeward flight. Before reaching his base he observed one of our aircraft which had come down on the sea. In spite of his own difficulties, Sqn. Ldr. Strutt flew over the position for half an hour until he saw torchlight signals from the stranded crew. He then flew on to base and, finding a means of lowering his undercarriage, was able to land his damaged aircraft safely.

Flt. Lt. J. E. M. WILLIAMS, R.A.F.V.R., No. 605 Sqn.—This officer is an exceptionally keen and skilful air gunner. During the intense air fighting over Dunkirk in May, 1940, he assisted in the destruction of five enemy aircraft within two days. This officer's fine record of service includes a large number of sorties by night as well as by day.

P/O. W. MARTIN, R.A.A.F., No. 107 Sqn.—In September, 1942, this officer navigated the leading aircraft of a section which attacked a whale oil ship off Cherbourg. Although the attack was executed in the face of heavy anti-aircraft fire, the ship received severe damage, and was later seen partially submerged. P/O. Martin's accurate bombing contributed in a large measure to the success obtained. Some days later he participated in a successful low level bombing attack on a factory. This officer's skilful navigation has resulted in locating two dinghies on the sea; in consequence seven lives were saved.

P/O. (now F/O.) J. C. M. ROSE, R.A.A.F., No. 103 Sqn.—This captain of aircraft has taken part in many operational sorties, and has shown courage and determination to press home his attacks regardless of the difficulties and opposition encountered. On one occasion when over enemy territory his aircraft was attacked by a Ju. 88. By skilful tactics he evaded the attacker, at the same time manœuvring his aircraft to enable his gunners to fire and severely damage the enemy aircraft. On two other occasions he has flown his aircraft back to home base and successfully landed with one engine out of action.



IN WAR PAINT: One of the De Havilland 86B Express Air Liners now in service with the R.A.F. on communication work.

Daylight Targets

P/O. T. L. RUSHTON, R.A.F.V.R., No. 107 Sqn.—This officer has completed numerous sorties, including many daylight attacks on shipping, airfields and industrial targets. In June, 1942, he participated in a night attack on an airfield in the Netherlands. In spite of heavy opposing fire and searchlight activity, P/O. Rushton bombed dispersal areas and hangars, causing much damage. Although his aircraft was hit by anti-aircraft fire which rendered it difficult to control, he flew it to base safely.

Wing Cdr. J. M. SOUTHWELL, No. 9 Sqn.—This officer has participated in many sorties, including attacks on many of the enemy's highly defended targets, both in Germany and German-occupied territory. In the raids on Le Creusot, Milan and Genoa, Wing Cdr. Southwell flew with distinction.

Flt. Lt. N. C. GREEN, R.A.F.V.R., No. 49 Sqn.—This officer has completed many sorties. In the raids on Le Creusot, Genoa and Milan he accomplished much good work.

F/O. R. E. CURTIS, R.A.F.V.R., No. 44 Sqn.—F/O. Curtis is a navigator of high merit. He has participated in numerous sorties, many of them in adverse weather. He took part in the recent raids on Genoa and Milan and his accurate navigation contributed materially to the safe return of his aircraft.

P/O. T. G. HACKNEY, R.A.F.V.R., No. 44 Sqn.—This officer has participated in numerous sorties, involving attacks on a wide range of enemy targets. In the recent attack on Genoa, P/O. Hackney attacked his objective successfully and obtained a photograph.

P/O. J. A. W. MOFFATT, R.A.F.V.R., No. 9 Sqn.—As wireless operator/air gunner, this officer has taken part in a large number of sorties, including the recent raids on Genoa and Milan. His skill is such that not once has he had a wireless failure.

BAR TO DISTINGUISHED FLYING MEDAL

Flt. Sgt. D. A. MACDONALD, D.F.M., No. 50 Sqn.—For citation see Sqn. Ldr. Everitt, D.F.C.

DISTINGUISHED FLYING MEDAL

Sgt. J. H. WOLTON, No. 50 Sqn.—For citation see Sqn. Ldr. Everitt, D.F.C.

Sgt. G. T. LENSON, No. 224 Sqn.—For citation see F/O. Sleep.

Sgt. W. J. MCKERRACHER, R.A.A.F., No. 113 Sqn.—For citation see F/O. Bassingthwaighte.

Flt. Sgt. D. M. CROZIER, R.C.A.F., No. 106 Sqn. For citation see P/Os. Healey, D.F.M., and Pennington.

Flt. Sgt. A. M. HALKETT, R.C.A.F., No. 15 Sqn.—This airman has completed numerous sorties and has displayed great efficiency, combined with outstanding determination to complete his tasks successfully.

Sgt. B. W. VAUGHAN, No. 103 Sqn.—Throughout his operational sorties this air-gunner has displayed a fine fighting spirit and a cheerful disregard of danger. One night in March he was detailed to attack Cologne. After successfully bombing the target, whilst on the return journey his aircraft was struck by a Ju 88 and seriously damaged. Although the rear turret in which Sgt. Vaughan sat was liable at any moment to fall off, with exceptional courage and devotion to duty he remained in his turret, giving his captain a running commentary, resulting in the probable destruction of the enemy aircraft.

Flt. Sgt. V. D. CROFT, No. 269 Sqn.—Flt. Sgt. Croft is an extremely efficient pilot. Within a period of six weeks, in July and August, 1942, he executed four determined attacks on U-boats.

Sgt. (now P/O.) G. F. FERN, No. 256 Sqn.—This airman has at all times proved himself to be a most valuable member of his aircraft crew. He volunteered for an extremely hazardous operation—flying in daylight over the centre of Paris. On June 12, 1942, Sgt. Fern navigated his aircraft to the target exactly as planned and dropped two French Tricolour flags at the correct points over Paris. Both during the operation and whilst over Paris, at roof top height, he took some excellent photographs.

Sgt. S. J. VOLANTE, No. 156 Sqn.—One night in October, 1942, this airman was the bomb aimer of an aircraft detailed to attack Cologne. Heavy cloud obscured the city, but, displaying great perseverance in the face of heavy anti-aircraft fire, Sgt. Volante succeeded in identifying the correct target. This airman has completed many sorties.

THE KING has been graciously pleased to approve the following awards:—

M.B.E. (MIL.).

Act. Flt. Lt. E. B. R. LOCKWOOD, R.A.F.V.R.—One night in July, 1942, a Wellington aircraft returned from a cross-country flight with one engine defective. Whilst circling the airfield the faulty engine stopped and the pilot proceeded to make an emergency landing. As the flare path was already in use by another aircraft which was also landing, the pilot of the Wellington decided to land on the port side, but in so doing he overshot the space available and ran into a building situated on the edge of the airfield. The aircraft and the building immediately caught fire. All the members of the crew were thrown clear with the exception of the wireless operator-air gunner, who was ejected on to the roof of the building, which was soon burning fiercely. Flt. Lt. Lockwood, displaying initiative and complete disregard for his own safety, made his way on to the roof by kicking out the window panes of a door. He found the injured airman, and then, carrying him in his arms, jumped from the roof only a few seconds before it collapsed.

P/O. B. A. COLEBORN, R.A.A.F.—P/O. Coleborn was the observer of an aircraft which crashed in flames after being attacked by enemy fighters. Two members of the crew were wounded. P/O. Coleborn assisted them to get clear of the wreckage, and in so doing he himself was badly burned. Nevertheless, displaying great courage and determination, he walked for 30 hours, although without water, across the desert. He then gave accu-

SERVICE AVIATION

rate information as to the location of the aircraft which resulted in the subsequent rescue of the remainder of the crew.

GEORGE MEDAL.

Sgt. J. REYNOLDS, A.A.F.—Sgt. Reynolds, who is employed in a technical capacity, was on duty in the flight office one day in July, 1942, when a Hudson aircraft crashed in flames some 400 yards away. Sgt. Reynolds was first to arrive at the scene of the crash. Displaying complete disregard for his own safety, he made his way straight into the flames and plunged through a door in the wrecked fuselage in an attempt to rescue the crew inside. The ammunition was exploding in all directions and, just as he reached the turret, a violent explosion occurred which threw him out of the aircraft. He was found lying blinded in the midst of the burning debris and narrowly missed being run over by a fire tender. All the crew of the aircraft were, unfortunately, killed in the crash.

Sgt. R. G. WHEATLEY, R.A.A.F.—During an air attack on the R.A.A.F. station at Sembawang, a hangar was hit by bombs and set on fire. Sgt. Wheatley took charge of the area and succeeded in removing three Buffalo aircraft to safety. The work was completed despite the grave danger which existed owing to the explosion of considerable quantities of ammunition and fuel stores. On another occasion at Palembang, two Blenheim aircraft crashed on the runway, one of them bursting into flames. Sgt. Wheatley succeeded in removing to safety three occupants of the second aircraft, which was only a short distance from the one on fire. Bombs from the burning aircraft demolished both aircraft just as Sgt. Wheatley was removing the last occupant.

B.E.M. (MIL.).

Sgt. K. E. DZINKOWSKI, R.C.A.F.—This airman was the wireless operator/air gunner of a Ventura aircraft which crashed one day in July, 1942. Sgt. Dzinkowski, although badly burned, returned to the aircraft and extricated another member of the crew. He dragged him 15 feet from the wreckage and then collapsed. Sgt. Dzinkowski sustained further burns whilst performing this gallant rescue.

Roll of Honour

Casualty Communique No. 180.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Royal Air Force

KILLED IN ACTION.—Sgt. L. R. C. Foxwell; W/O. R. C. Hamer.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. G. C. Grieve; Sgt. J. Harrop; P/O. N. E. Myring; Sgt. D. P. Stock; Sgt. C. W. Valder; Act. Sqn. Ldr. F. D. Webster, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Act. Grp. Capt. F. V. Beamish, D.S.O., D.F.C., A.F.C.; Sgt. E. L. Beck; Sgt. F. Bonser; Sgt. L. P. Bow; Sgt. T. F. Burn; Wing Cdr. J. H. A. Chapman; Sgt. I. B. Dopson; Sgt. C. C. Duce; Sgt. G. E. Fox; W/O. A. J. Gulliver; P/O. T. K. Haynes; Sgt. H. Inman; Act. Flt. Lt. A. J. Love; Sgt. A. F. Moraes; P/O. J. W. Murray; Flt. Sgt. G. G. Noseley; Sgt. C. W. Penny; Sgt. D. E. A. Rendtorff; Sgt. R. R. Rowell; P/O. E. Sharman; Sgt. F. J. Wakefield.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. G. F. Johnson.

MISSING, BELIEVED KILLED IN ACTION.—Act. Flt. Lt. D. Adams; P/O. R. A. Ainslie; Sgt. J. W. Atkinson; Sgt. F. J. C. Barnes; P/O. A. F. Birley; Sgt. A. K. Bonser; Sgt. M. W. Booth; Sgt. L. G. Carr; Sqn. Ldr. R. N. Collins, D.F.C.; Sgt. J. R. Davies; Sgt. G. H. Doman; Sgt. L. G. Dunkling; P/O. W. G. Elby; Sgt. A. E. Grounsell; P/O. J. A. Gruber; Sgt. F. N. Hadley; Act. Flt. Lt. M. R. Hodges; Sgt. S. C. Holden; Sgt. R. James; Sgt. H. L. Jones; Flt. Sgt. J. L. Lawler; P/O. W. May; Sgt. E. Merideth; Flt. Sgt. J. H. Millins; Flt. Sgt. T. E. Newby; Sgt. A. Priestley; Sgt. J. Ramsey; Sgt. W. J. Sharpe; Act. Sgt. C. Smith; W/O. J. G. Smith; Flt. Sgt. C. N. D. Stewart; Sgt. I. M. R. Stewart; Sgt. G. Walder; Sgt. M. E. Wheatcroft; Sgt. J. B. Wilkes; Flt. Sgt. B. A. Wolstencroft.

MISSING.—Sgt. C. Aitken; P/O. H. W. Aldridge; Sgt. R. M. Alexander; Sgt. D. Alford; P/O. J. Antoine; F/O. W. J. E. Ardley; Sgt. H. Barton Smith; P/O. E. Beale; Act. Flt. Lt. N. A. Bennitt, D.F.C.; Flt. Sgt. J. R. Bird; Sgt. E. A. Blore; Sgt. C. J. Broomhead; Sgt. E. G. Burton; Sgt. J. Canniff; P/O. R. A. Castell; Sgt. F. D. Chudleigh; Flt. Lt. G. L. Clack; Sgt. H. Clark; Sgt. E. Collingwood; Sgt. C. H. Cornish; P/O. J. R. Cruickshank; Sgt. C. G. E. Dearlove; F/O. L. Dewhurst; Sgt. H. E. Drake; Sgt. C. J. Dupreez, D.F.M.; P/O. A. Eaton; Sgt. F. H. Edwards; P/O. G. W. Evans, P/O. H. Fallas; Sgt. J. Farrimond; P/O. C. de C. Findlay; Sgt A. K. Fish; Sgt. G. Fleck; Sgt. H. Forshaw; Sgt. R. S. Gibbons, D.F.M.; Flt. Sgt. A. O. Graham; Sgt. C. E. Hagan; F/O. R. A. Haig; Flt. Sgt. A. Harker P/O. A. B. Hastings; Sgt. K. Hawthorne; Sgt. R. T. Higgins; P/O. K. A. Higgs; Sgt. H. B. Hill; Sgt. E. J. Hindley; Sgt. R. Howatt; Sgt. G. Hughes; Sqn. Ldr. G. C. Hyde; Sgt. E. C. Ibbotson; P/O. C. F. Isaacs; Sgt. F. J. James; Sgt. D. A. V. John; Sgt. N. F. Johnson; Sgt. W. H. P. Knight; Flt. Sgt. V. G. Lawrence; Sgt. G. Leadbeater; Sgt. J. G. Leech; Sgt. J. E. Littlewood; Sgt. J. O. Ludgate; P/O. W. R. B. McCarthy; Sgt. V. J. Mackey; Sgt G. F. Medhurst; F/O. D. G. Newman; Sgt. F. A. W. Nice; Sgt. J. D. Osbaldeston; Sgt. A. G. Oswin; Sgt. C. V. Pattison; Sgt. G. V. Payne; Sgt. A. Pogrel; Flt. Lt. P. D. Pool; Sgt. J. V. Robinson; Act. Wing Cdr. J. K. Rogers; P/O. S. Rosenberg; P/O. F. F. Ross; Sgt. D. Rowles; Sgt. R. Sawyer; P/O. T. P. Scanlan; Sgt. F. A. Scotland; F/O. A. L. Searby; Flt. Lt. D. C. Sharman; Sgt. P. S. Sharman; Sgt. R. W. Sherwin; P/O. R. R. Smithyman; Sgt. N. Spalding; Sgt. J. S. Spark; Sgt. E. F. Stanley; Flt. Sgt. E. P. Talbot; P/O. J. la R. Taylor; Sgt. A. K. Taylor-Thomas; Act. Flt. Lt. C. Thomas, D.F.C.; P/O. E. Tonge; Sgt. A. E. Townsend; P/O. G. L. Tudor; P/O. A. A. Turner; Sgt. G. O. Tyler; Sgt. S. R. Vowles; Sgt. M. F. N. Wadham; Sgt. K. Wakefield; Sgt. A. Wale; Sgt. A. W. Waller; P/O. R. M. Watson; Sgt. J. T. Worrall; W/O. R. F. H. Young, D.F.M.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. R. C. Santley.

KILLED ON ACTIVE SERVICE.—Sgt. W. Allinson; Sgt. J. C. Burgon; P/O. D. G. Davies; L.A/C. L. A. E. Dines; L.A/C. T. G. Hornsey; L.A/C. J. F. Hussey; P/O. J. Keddie; Sgt. P. McLarnon; L.A/C. R. G. Mitchell; Sgt. H. W. Spencer.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—A/C.2 T. W. Fenton; Sgt. D. R. Lake; L.A/C. N. B. Rendall; L.A/C. H. V. S. Richardson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 W. B. Burns; Sgt. J. A. F. Gabb; Act. F/O. H. C. Mottershead; A/C.2 C. Neville; Flt. Sgt. A. G. Richards; P/O. W. F. White.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. B. Cross; Sgt. A. H. Elliott.

DIED ON ACTIVE SERVICE.—L.A/C. J. C. Cassidy; L.A/C. W. E. Dodds; L.A/C. F. Dootson; Grp. Capt. I. G. V. Fowler, A.F.C.; A/C.2 J. Graver; A/C.1 F. S. W. Harvey; A/C.1 D. F. Holder; A/C.2 J. Wareing.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. S. H. Cusden; Sgt. D. Ellis; Sgt. J. Holloway.

THE CORSAIR: A new photograph of the Vought Sikorsky F4U shipboard fighter. It is credited with a speed in excess of 400 m.p.h. Span, 40ft.; length, 30ft.; engine, 2,000 h.p. Pratt & Whitney Double Wasp.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—L.A/CW. A. M. Town.

Royal Australian Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. C. D. Kelly; Sgt. A. S. Millis; P/O. R. G. Rowlands.

MISSING.—Sgt. D. Canet; P/O. G. L. John; Sgt. K. Newberry; Flt. Sgt. A. Norman; Sgt. G. A. Swann; F/O. O. J. Sanderson; Sgt. I. V. Whitham; Sgt. C. A. Williams.

DIED ON ACTIVE SERVICE.—Sgt. G. N. McAlister.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. K. A. Fogg.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. J. M. Dunlop; Flt. Sgt. G. E. Eichar; Flt. Sgt. T. J. Hartnett.

MISSING.—Sgt. J. W. Biggs; Sgt. J. Breivis; Sgt. L. J. Capton; Sgt. M. R. Derrick; Sgt. C. D. Dixon; Sgt. C. C. D. Fraser; Flt. Sgt. E. W. J. Gilson; Sgt. H. E. Heath; Sgt. J. J. Kincaid; W/O. W. E. Lunan; Flt. Sgt. J. W. Newman; Sgt. E. T. O'Neil; P/O. E. C. Patterson; Sgt. H. E. Roberts; Sgt. H. M. Russell; Flt. Sgt. W. N. Shumsky; Flt. Sgt. V. C. W. Trowbridge; Sgt. S. A. Wilson; Sgt. F. H. R Wright.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. P. W. O. Gammon.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Sgt. G. T. Brown; Flt. Sgt. R. M. Darling; Act. Flt. Lt. L. St. G. Dobbin; Sgt. J. D. Follett; Sgt. J. L. Jury; Sgt. F. E. Kearns; P/O. A. McCarthy; Sgt. G. A. Smith; Sgt. M. Swan.

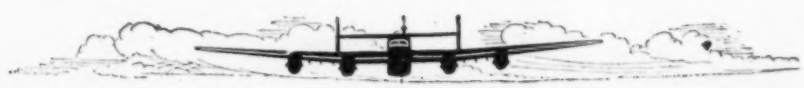
MISSING.—Sgt. L. Jones; Sgt. L. E. Moss; Act. Flt. Lt. J. [illegible] Smith, D.F.M.

KILLED ON ACTIVE SERVICE.—Sgt. G. F. Ridgway.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Capt. L. N. Evans.

MISSING.—Lt. N. W. Hancock.

Indian Air Force

DIED ON ACTIVE SERVICE.—Sweyer Aminalw.